

Appendices

APPENDIX A

Detailed Description of the Action Alternatives

This appendix describes the action alternatives in detail. Each alternative is described in terms of the goals, objectives, actions, guidelines, and mitigation measures. The terms, “goals”, “objectives”, and “guidelines” have the specific meanings, as defined in the BLM Planning Handbook:

goal: a broad statement of a desired outcome. Goals are usually not quantifiable and may not have established time frames for achievement.

objective: a description of a desired condition for a resource. Objectives can be quantified and measured and, where possible, have established time frames for achievement.

guidelines: actions or management practices that may be used to achieve desired outcomes, sometimes expressed as best management practices.

(BLM Handbook H-1601-1, Appendix A; available online: <http://www.blm.gov/nhp/efoia/wo/handbook/h1601-1.pdf>).

The goals are the same for each alternative: they are the three purposes of the action defined in Chapter 1 of this EIS. The objectives are the heart of the alternatives and vary considerably among the alternatives. Each alternative’s set of objectives represents a different way of achieving the same set of goals. The “actions” are the specific management actions that would be taken to achieve a specific objectives. The guidelines are intended to be advisory rather than absolute in nature. For some actions, specific “mitigations measures” are presented to make the effect of the action less harsh or severe.

ALTERNATIVE B

Plantation and Road Management with No Timber Harvest

Restore plantations and roads and let nature do the rest

GOAL 1: Protect and enhance late-successional and old-growth forest ecosystems.

OBJECTIVE: On decommissioned and BLM-controlled roads, control noxious weeds within 10 years sufficient to ensure they do not penetrate into late-successional stands.

ACTION: Inventory roads within or adjacent to late-successional stands for the presence of noxious weeds.

ACTION: Remove noxious weeds from BLM-controlled roads, including roads to be decommissioned.

ACTION: Plant trees or other native species in the decommissioned roads to prevent noxious weeds from becoming established in areas where weed seed is likely to spread into the decommissioned roads.

GUIDELINE:

- Use methods to remove weeds such as mowing, pulling, cutting and grubbing depending on the weed species.

OBJECTIVE: Decommission all roads where legally possible within 10 years. (See Goal #3).

ACTION: Decommission the roads shown in Appendix E.

GUIDELINE

- In determining the timing for decommissioning, consider the road's risk ratings in the TMP, and the need for the road to complete other management actions beyond the late-successional stand.

ACTION: Decommission unnumbered roads and non-designated trails as needed to protect and enhance late-successional forests.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on the decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned roads as needed to restrict vehicular traffic.

GOAL 2: Foster the development of late-successional forest structure and composition in plantations and young forests within LSR 267.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 90% (100% of stands; 90% of acres) of the 1-20 year age class, so that tree densities range from 40-110 TPA by age 21.

ACTION: Thin approximately 1/3 of stands aged 11 to 20 years to a stand average of 40-60 Douglas-fir trees per acre, with variable spacing.

ACTION: Thin approximately 1/3 of stands aged 11 to 20 years to a stand average of 60-80 Douglas-fir trees per acre, with variable spacing.

ACTION: Thin approximately 1/3 of stands aged 11 to 20 years to a stand average of 80-110 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on random or highly variable spacing.
- Leave all cut trees in the stand.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, minimize thinning along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 75% (80% of stands; 95% of acres) of the 21-40 year age classes, so that tree densities range from 50-150 TPA of Douglas-fir by age 41.

ACTION: Thin plantations aged 21 to 30 years to a treated stand average of 50-100 Douglas-fir trees per acre.

ACTION: Thin plantations aged 31 to 40 years to a treated stand average of 100-150 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention without regard for tree spacing. Diameter limit prescriptions ranging from 10" dbh to 12" dbh might be typical.
- Leave all cut trees in the stand.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Limit the cutting of trees >12" dbh to lessen the risk of Douglas-fir bark beetle infestation. (Some trees >12" dbh will be specifically selected for snag and/or coarse woody debris creation).

- Lessen fire risk from thinning by not creating high fuel loads near roads. Appropriate mitigations include measures such as pulling-back cut trees from road edge; hand-piling and burning cut trees; or leaving part of the stand unthinned.
- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds.
- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile.
- Avoid creating large concentrations of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 75% (80% of stands; 95% of acres) of the 41-50 year age classes, so that tree densities range from 100-200 TPA of Douglas-fir by age 51.

ACTION: Thin plantations aged 41 to 50 years to a treated stand average of 100-200 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention without regard for tree spacing. A diameter limit prescription of 12" dbh might be typical.
- Leave all cut trees in the stand.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Limit the cutting of trees >12" dbh to lessen the risk of Douglas-fir bark beetle infestation. (Some trees >12" dbh will be specifically selected for snag and/or coarse woody debris creation).
- Lessen fire risk from thinning by not creating high fuel loads near roads. Appropriate mitigations include measures such as pulling-back cut trees from road edge; hand-piling and burning cut trees; or leaving part of the stand unthinned.
- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds.
- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile.
- Avoid creating large concentration of fallen trees with intact needles or leaves in areas with poor oxygen reaeration (e.g., stream reaches with high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (i.e., summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

OBJECTIVE: In stands treated under the above objectives, develop densities of shade-tolerant conifers to ensure that by age 81, they contain densities similar to those found in mature natural stands (26-90 TPA >2" dbh).

ACTION: In stands thinned at ages 31-50, plant seedlings of shade-tolerant conifers at densities of 26-200 trees per acre.

GUIDELINES:

- Planting may be concentrated in distribution in response to site-specific conditions, such as overstory density, shrub competition, and ground disturbance, and need not be evenly distributed across the stand. Planting densities should generally be met at the scale of 10 acres (e.g., 260-2000 trees/10 acres).

OBJECTIVE: In stands treated under the above objectives, develop quantities of snags and coarse woody debris to ensure that by age 81, they contain amounts consistent with Alternative #2 in the LSR Assessment (1102-3794 cu. ft./acre).

ACTION: In stands thinned at ages 21-50, thinning prescriptions described above would include cutting 5-10 Douglas-fir trees/acre >12" dbh (>150 cu.ft./acre) for coarse woody debris at the time of thinning operations. Total coarse woody debris minimum targets of 551 cu.ft./acre would typically be exceeded by the trees <12" dbh cut as part of thinning operations (which would typically create >1000 cu.ft./acre of coarse woody debris).

GUIDELINES:

- Coarse woody debris should mostly be concentrated in distribution to provide planting sites for shade-tolerant conifers. Coarse woody debris levels should generally be met at the scale of 10 acres (e.g., 5510 cu.ft./10 acres).

ACTION: In stands thinned at ages 21-50, create sufficient snags to meet stand average snag levels of at least 551 cu.ft./acre. Snags may be created by a variety of methods, including girdling, topping, blasting, and/or fungal inoculation.

GUIDELINES:

- Snag creation may be done at the time of thinning or delayed to allow time to assess natural tree mortality levels following thinning. Regardless, snag levels should be met within 5 years of the thinning operations.
- Snags should mostly be concentrated in distribution to provide planting sites for shade-tolerant conifers. Snag levels should generally be met at the scale of 10 acres (e.g., 5510 cu.ft./10 acres). Individual snag patches (i.e., areas in which all Douglas-fir trees are killed) should generally be limited to less than 1/4 acre in size.
- At least half of the trees left for snags should have diameters greater than the pre-treatment stand average diameter.

GOAL 3: Reconnect streams and reconnect stream channels to their riparian zones and upslope areas within LSR 267.

OBJECTIVE: Decommission all roads where legally possible within 10 years.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINES:

- Decommissioning may include any of the following measures:
 - discontinuing road maintenance;
 - tilling the road surface with dozer and subsoiler implement or a track mounted excavator;
 - removing gravel or pulling of gravel into the ditch line;
 - scarifying roads for creation of planting areas;

- removing side cast soils from fill slopes with a high potential for triggering landslides;
 - filling and contouring of cut slope ditch lines to the adjacent hill slope;
 - removing culverts;
 - stabilizing stream crossings (e.g., recounering stream channels, placement of mulch or mats and seeding for erosion control, placement of rock and logs);
 - installing water bars, cross sloping or drainage dips to ensure adequate drainage into vegetated areas and away from streams or unstable road fills;
 - blocking the road using barricades, gating, or earth berm barriers;
 - placing slash, boulders, and/or woody debris on the road surface to deflect runoff, discourage OHV use, and promote vegetative growth;
 - seeding or planting for erosion control.
- Along roads being decommissioned, generally remove culverts and recontour stream channels to achieve streambank stability.

ACTION: On roads to be decommissioned, subsoil (i.e., break up areas of soil compaction) the road surface sufficient to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned road as needed to restrict vehicular traffic.

OBJECTIVE: **On roads that will not be decommissioned, reduce the risk to the aquatic ecosystem attributable to the road network within 10 years.**

ACTION: Eliminate all barriers to movements of anadromous fish and other aquatic organisms attributable to BLM-controlled roads.

GUIDELINES:

- Barriers may be eliminated by removal, replacement, or modification of culverts, and/or installation of downstream structures to raise upstream water levels within culverts or upstream structure to stabilize accumulated deposition.

ACTION: Develop and implement Memoranda of Understanding with adjacent road- and land-owners to eliminate barriers to movements of anadromous fish and other aquatic organisms attributable to non-BLM roads or lands.

ACTION: Remove or replace culverts that have a high risk of failure.

GUIDELINES:

- Along roads that will not be decommissioned, replace existing culverts that are failed, undersized, or constitute passage barriers. An existing culvert may be replaced with another culvert, a half-arch or a bridge.
- For culverts creating a passage barrier, where removal or replacement are not feasible, access to the culvert may be created or improved by downstream log or boulder structure designed to elevate the stream channel and create pools to facilitate movement into the culvert. Downstream structures may also be used in conjunction with culvert replacement to improve passage.

ALTERNATIVE C

Continue Current Management Approach

Manage young stands using current silvicultural techniques and continue riparian restoration at the current pace

GOAL 1: Protect and enhance late-successional and old-growth forest ecosystems.

OBJECTIVE: On decommissioned and BLM-controlled roads, control noxious weeds within 10 years sufficient to ensure they do not penetrate into late-successional stands.

ACTION: Inventory roads within or adjacent to late-successional stands for the presence of noxious weeds.

ACTION: Remove noxious weeds from BLM-controlled roads, including roads to be decommissioned.

ACTION: Plant trees or other native species in the decommissioned roads to prevent noxious weeds from becoming established in areas where weed seed is likely to spread into the decommissioned roads.

GUIDELINE:

- Use methods to remove weeds such as mowing, pulling, cutting and grubbing depending on the weed species.

OBJECTIVE: Decommission or close and stabilize non-shared, BLM-controlled roads that (1) are capable of delivering sediment to streams, (2) are damaged and not needed for future access, or (3) dead-end in late-successional stands.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINE:

- In determining the timing for decommissioning, consider the need for the road to complete other management actions beyond the late-successional stand.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on the decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned roads as needed to restrict vehicular traffic.

GOAL 2: Foster the development of late-successional forest structure and composition in plantations and young forests within LSR 267.

OBJECTIVE: Reduce tree density while maintaining even spacing in 100% of the 1-20 year age class that has not been pre-commercially thinned, so that tree densities range from 100-220 TPA by age 21.

ACTION: Thin 90% of stands aged 11 to 20 years at 14' x 14' to 17' x 17' conifer spacing, with even spacing and consistent tree density within stands ("pre-commercial thinning").

ACTION: Thin 10% of stands aged 11 to 20 years at 20' x 20' conifer spacing, with even spacing and consistent tree density within stands ("pre-commercial thinning").

GUIDELINES:

- Select the largest, most vigorous trees for retention within overall even spacing.
- Leave most or all cut trees in the stand.
- Retain most minor conifers (i.e., western hemlock, western red-cedar, grand fir, and incense-cedar) as part of the overall conifer spacing, giving greater preference to minor conifers when they are more scarce.
- Retain most larger hardwoods (typically retain hardwoods >12" dbh).
- Generally avoid thinning within 10' of perennial streams.

OBJECTIVE: Reduce tree density in 900 acres (40% of stands; 50% of acres) of the 41-80 year age classes, so that tree densities range from 40-110 TPA by age 80.

ACTION: Thin 20% (40% of stands; 50% of acres) of stands aged 41 to 50 years by commercial timber sale. Retain between 60-110 trees per acre.

ACTION: Thin 20% (40% of stands; 50% of acres) of stands aged 51 to 80 years by commercial timber sale. Retain between 50-110 trees per acre.

GUIDELINES:

- Thin from below: select the largest, most vigorous trees for retention.
- Retain lower tree densities in stands that were previously commercially thinned.
- Retain minor conifers (e.g., western hemlock, western red-cedar, grand fir, and incense-cedar) and hardwoods, except for safety or operational reasons.
- Retain existing snags and coarse woody debris of decay classes 3, 4, and 5, except for safety or operational reasons.
- Retain in the stand any snags felled for safety or operational reasons.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.
- Avoid thinning within 50' of streams (or the topographic break, whichever is greater).
- Give preference to stands with existing road systems that allow thinning with the least new road construction.

MITIGATION MEASURES

- Do not reduce stand average canopy closure below 40% to maintain spotted owl dispersal habitat.
- Evaluate stands ≥ 51 years old with older remnant trees for potential marbled murrelet habitat. Survey potential habitat or leave untreated.

ACTION: Construct new roads and renovate existing roads as needed to access areas selected for thinning.

GUIDELINES:

- Generally avoid constructing new stream crossings.
- Where new stream crossings are required, use temporary roads that are decommissioned after a single logging season.

MITIGATION MEASURES:

- Do not build new roads in stands > 80 years old.
- Waterbar temporary roads between logging seasons.
- Subsoil temporary roads upon completion of project as needed to reduce soil compaction.
- Block decommissioned roads to restrict vehicular access.

OBJECTIVE: In stands treated under the above objectives, develop densities of shade-tolerant conifers to ensure that by age 81, they contain densities similar to those found in mature natural stands (26-90 TPA $> 2"$ dbh).

ACTION: Within stands that are thinned to below 80 TPA and lack sufficient shade-tolerant conifer trees or seedlings to meet the objective, plant seedlings of shade-tolerant conifers (western hemlock, western red-cedar, grand fir, incense-cedar and/or Pacific yew) at densities of 100-200 trees per acre.

GUIDELINES:

- Give preference in planting to areas with the greatest likelihood of seedling establishment and growth, considering factors such as post-thinning overstory density and shrub competition.
- Within areas selected for planting, plant seedlings with even spacing.

OBJECTIVE: In stands treated under the above objectives, develop quantities of snags and coarse woody debris to ensure that by age 81, they contain amounts consistent with Alternative #3 in the LSR Assessment (525-2844 cu. ft./acre).

ACTION: Cut and leave 3-15 Douglas-fir trees per acre as coarse woody debris (approximately 100-500 cu.ft./acre) in stands thinned at ages 41-80 in which coarse woody debris needs are not being met.

ACTION: Create snags by killing 1-3 Douglas-fir trees per acre (approximately 30-100 cu.ft./acre) in stands thinned at ages 41-80 in which snag needs are not being met. Snags may be created by a variety of methods, including girdling, topping, blasting, and/or fungal inoculation.

GUIDELINES:

- Snag and coarse woody debris creation may be done at the time of thinning or delayed to allow time to assess natural tree mortality levels following thinning. Regardless, snag and coarse woody debris levels should be met within 10 years of the thinning operations.

- Coarse woody debris and snags may be concentrated in distribution and need not be evenly distributed across the stand. Coarse woody debris and snag levels should generally be met at the scale of 10 acres. Individual coarse woody debris and snag patches (i.e., areas in which all Douglas-fir trees are cut or killed) should generally be limited to less than 1/4 acre in size.

GOAL 3: Reconnect streams and reconnect stream channels to their riparian zones and upslope areas within LSR 267.

OBJECTIVE: Decommission or improve all roads capable of delivering sediment to streams, as identified in watershed analysis within 10 years.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINES:

- Decommissioning may include any of the following measures:
 - discontinuing road maintenance;
 - tilling the road surface with dozer and subsoiler implement or a track mounted excavator;
 - removing gravel or pulling of gravel into the ditch line;
 - scarifying roads for creation of planting areas;
 - removing side cast soils from fill slopes with a high potential for triggering landslides;
 - filling and contouring of cut slope ditch lines to the adjacent hill slope;
 - removing culverts;
 - stabilizing stream crossings (e.g., recounering stream channels, placement of mulch or mats and seeding for erosion control, placement of rock and logs);
 - installing water bars, cross sloping or drainage dips to ensure adequate drainage into vegetated areas and away from streams or unstable road fills;
 - blocking the road using barricades, gating, or earth berm barriers;
 - placing slash, boulders, and/or woody debris on the road surface to deflect runoff, discourage OHV use, and promote vegetative growth;
 - seeding or planting for erosion control.
- Along roads being decommissioned, generally remove culverts and recontour stream channel to achieve streambank stability.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned road as needed to restrict vehicular traffic.

OBJECTIVE: On roads that will not be decommissioned, reduce the risk to the aquatic ecosystem attributable to the road network within 10 years.

ACTION: Eliminate all barriers to movements of anadromous fish attributable to BLM-controlled roads.

GUIDELINES:

- Barriers may be eliminated by removal, replacement, or modification of culverts, and/or installation of downstream structures to raise upstream water levels within culverts or upstream structure to stabilize accumulated deposition.

ACTION: Develop and implement Memoranda of Understanding with adjacent road- and land-owners to eliminate barriers to movements of anadromous fish attributable to non-BLM roads or lands.

ACTION: Remove or replace culverts that have a high risk of failure.

GUIDELINES:

- Along roads that will not be decommissioned, replace existing culverts that are failed, undersized, or constitute passage barriers. An existing culvert may be replaced with another culvert, a half-arch or a bridge.
- For culverts creating a passage barrier, where removal or replacement are not feasible, access to the culvert may be created or improved by downstream log or boulder structure designed to elevate the stream channel and create pools to facilitate movement into the culvert. Downstream structures may also be used in conjunction with culvert replacement to improve passage.

OBJECTIVE: Increase stream structure to 56 structures/stream mile along 3.8 miles of streams within 10 years.

ACTION: Construct woody debris structures with at least 3 key pieces/structure in 3rd, 4th, or 5th-order streams.

GUIDELINES:

- Key pieces should generally be greater than 50' long and $\geq 24"$ dbh.
- Cable or otherwise stabilize structures as needed in streams that are devoid of existing stable structure that has the potential to accumulate future woody debris recruitment.
- Wood imported from off-site (e.g., purchased logs or any other logs not from adjacent or nearby stands) should generally be used in structures on 4th and 5th-order streams.

ACTION: In riparian Douglas-fir stands ≤ 80 years old and adjacent to upland thinning actions, fall or pull over trees into the stream to increase levels to 50-160 pieces/stream mile of woody debris.

GUIDELINES:

- Fall or pull trees from between 25' and 100' from the stream channel.
- Fall or pull trees from across the range of diameter classes in the stand.
- Generally select Douglas-fir for falling or pulling.
- The number of trees to be felled or pulled will be determined by site-specific factors such as stream size, existing stream structure, and riparian stand conditions.

OBJECTIVE: In 5% of riparian (<100' from stream) hardwood-dominated stands, attain 75% canopy cover of conifers by age 81.

ACTION: Cut hardwoods and shrubs to provide growing space for conifers in hardwood-dominated stands in riparian zone (i.e., <100' from streams).

GUIDELINES:

- Cut or girdle competing hardwoods and shrubs to release existing conifer saplings or to create planting sites for conifers
- Select for cutting primarily red alder and tall shrubs, such as salmonberry, that compete aggressively with conifer saplings.
- Some trees may be girdled instead of cut to create snags.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).

ACTION: Plant conifer seedlings and/or saplings in hardwood-dominated stands that were treated under the previous action and lack sufficient conifers to meet objective densities.

GUIDELINES:

- Species planted will be primarily western red-cedar and Douglas-fir, but may also include western hemlock and grand fir, depending on specific site conditions.
- Give preference in planting to areas with the greatest likelihood of conifer establishment and growth, considering factors such as soil conditions, overstory density and shrub competition.
- Planting may be concentrated in distribution in response to site-specific conditions and need not be evenly distributed across the stand.
- Tube western red-cedar seedlings to reduce browsing.
- Control competing shrub vegetation by placing mats or mulch around the trees or by cutting competing shrubs at planting and during subsequent years as needed to establish trees.

ALTERNATIVE D

T&E Species Recovery

Maximize the development of habitat for spotted owls, marbled murrelets, and coho salmon where possible with minimal impacts to existing habitat

GOAL 1: Protect and enhance late-successional and old-growth forest ecosystems.

OBJECTIVE: On decommissioned and BLM-controlled roads, control noxious weeds within 10 years sufficient to ensure they do not penetrate into late-successional stands.

ACTION: Inventory roads within or adjacent to late-successional stands for the presence of noxious weeds.

ACTION: Remove noxious weeds from BLM-controlled roads, including roads to be decommissioned.

ACTION: Plant trees or other native species in the decommissioned roads to prevent noxious weeds from becoming established in areas where weed seed is likely to spread into the decommissioned roads.

GUIDELINES:

- Use methods to remove weeds such as mowing, pulling, cutting and grubbing depending on the weed species.

OBJECTIVE: Decommission all non-shared, BLM-controlled roads within or adjacent to late-successional stands within 10 years.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINES:

- In determining the timing for decommissioning, consider whether the road would provide access for other management actions.

ACTION: Decommission unnumbered roads and non-designated trails as needed to protect and enhance late-successional forests.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on the decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned roads as needed to restrict vehicular traffic.

GOAL 2: Foster the development of late-successional forest structure and composition in plantations and young forests within LSR 267.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 90% (100% of stands; 90% of acres) of the 1-20 year age class that has not been pre-commercially thinned, so that tree densities range from 75-150 TPA by age 21.

ACTION: Thin approximately 1/3 of stands aged 11 to 20 years to a stand average of 75-100 Douglas-fir trees per acre.

ACTION: Thin approximately 1/3 of stands aged 11 to 20 years to a stand average of 100-120 Douglas-fir trees per acre.

ACTION: Thin approximately 1/3 of stands aged 11 to 20 years to a stand average of 120-150 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select the largest, healthiest trees for retention, regardless of spacing.
- Leave most or all cut trees in the stand.
- Generally apply the lower density prescriptions to the older stands within the age class.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 90% (100% of stands; 90% of acres) of the 1-20 year age class that has been pre-commercially thinned, so that tree densities range from 40-60 TPA {within 10 years}.

ACTION: Thin stands in uplands (i.e., >100' from streams) to a treated stand average of 40-60 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on random or highly variable spacing. Select trees <20" dbh approximately in proportion to their abundance amongst diameter classes.
- Do not select trees >20" dbh for cutting. Leave in the stand any trees >20" dbh felled for safety or operational reasons.
- Leave in the stand any cut trees >16" dbh.
- Remove cut trees <16" dbh as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary in stands that have been pre-commercially thinned more than 8 years ago.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

- Generally apply thinning more than 8 years after pre-commercial thinning.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

ACTION: Thin stands in riparian zone (i.e., <100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention within approximately even spacing to maximize individual tree growth.
- Generally leave all cut trees in the stand. Some removal may be needed to mitigate fire risk in limited locations, such as near roads.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.
- Generally apply thinning more than 8 years after pre-commercial thinning.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit the cutting of trees >12" dbh to lessen the risk of Douglas-fir bark beetle infestation. (Some trees >12" dbh will be specifically selected for snag and/or coarse woody debris creation).
- Lessen fire risk from thinning by not creating high fuel loads near roads. Appropriate mitigations include measures such as removing cut trees from the stand; pulling-back cut trees from road edge; hand-piling and burning cut trees; or leaving part of the stand unthinned.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 75% (100% of stands; 75% of acres) of the 21-30-year age class, so that tree densities range from 40-110 TPA by age 31.

ACTION: Among stands aged 21 to 30 years that were pre-commercially thinned, thin approximately 1/3 of stands in uplands (i.e., >100' from streams) to a treated stand average of 40-60 Douglas-fir trees per acre, with variable spacing.

ACTION: Among stands aged 21 to 30 years that were pre-commercially thinned, thin approximately 1/3 of stands in uplands (i.e., >100' from streams) to a treated stand average of 60-80 Douglas-fir trees per acre, with variable spacing.

ACTION: Among stands aged 21 to 30 years that were pre-commercially thinned, thin approximately 1/3 of stands in uplands (i.e., >100' from streams) to a treated stand average of 80-110 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on random or highly variable spacing. Select trees <20" dbh approximately in proportion to their abundance amongst diameter classes.
- Do not select trees >20" dbh for cutting. Leave in the stand any trees >20" dbh felled for safety or operational reasons.
- Leave in the stand any cut trees >16" dbh.
- Remove cut trees <16" dbh as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary in stands that have been pre-commercially thinned more than 8 years ago.

- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

ACTION: Among stands aged 21 to 30 years that were not pre-commercially thinned, thin 75% of uplands (i.e., >100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention without regard for tree spacing. A diameter-limit prescription of 10" dbh (i.e., all Douglas-fir <10" dbh would be cut) might be typical.
- Leave in the stand any cut trees >16" dbh, such as those felled for safety or operational reasons (trees >12" dbh will rarely be selected for cutting).
- Remove cut trees <16" dbh as necessary to reduce risk of fire or insect infestation.
- Densities may be left higher than 110 trees per acre in areas if needed to maintain stand stability.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

ACTION: Among stands aged 21 to 30 years, thin 75% of acres of Douglas-fir stands in riparian zone (i.e., <100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention within approximately even spacing to maximize individual tree growth.
- Generally leave all cut trees in the stand. Some removal may be needed to mitigate fire risk in limited locations, such as near roads.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

- Limit the cutting of trees >12" dbh to lessen the risk of Douglas-fir bark beetle infestation. (Some trees >12" dbh will be specifically selected for snag and/or coarse woody debris creation).
- Lessen fire risk from thinning by not creating high fuel loads near roads. Appropriate mitigations include measures such as removing cut trees from the stand; pulling-back cut trees from road edge; hand-piling and burning cut trees; or leaving part of the stand unthinned.
- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 50% (100% of stands; 50% of acres) of the 31-50-year age class, so that tree densities range from 40-110 TPA by age 51.

ACTION: Among stands aged 31 to 50 years, thin approximately 1/4 of stands in uplands (i.e., >100' from streams) to a treated stand average of 40-60 Douglas-fir trees per acre, with variable spacing.

ACTION: Among stands aged 31 to 50 years, thin approximately 1/4 of stands in uplands (i.e., >100' from streams) to a treated stand average of 60-80 Douglas-fir trees per acre, with variable spacing.

ACTION: Among stands aged 31 to 50 years, thin approximately 1/4 of stands in uplands (i.e., >100' from streams) to a treated stand average of 80-110 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on random or highly variable spacing. Select trees <20" dbh approximately in proportion to their abundance amongst diameter classes.
- Do not select trees >20" dbh for cutting in the thinning prescription (some trees >20" dbh will be cut to meet coarse woody debris objectives). Do not harvest any trees >20" dbh felled for safety or operational reasons (though trees may be moved to provide coarse woody debris to other stands or streams).
- Remove cut trees <20" dbh as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary.
- Retain existing snags and coarse woody debris, except for safety and operational reasons.
- Retain in the stand any snags felled for safety or operational reasons.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

ACTION: Among stands aged 31 to 50 years, thin approximately 1/4 of stands in uplands (i.e., >100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre without regard to spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention without regard for tree spacing.

- Do not select trees >20" dbh for cutting in the thinning prescription (some trees >20" dbh will be cut to meet coarse woody debris objectives). Do not harvest any trees >20" dbh felled for safety or operational reasons (though trees may be moved to provide coarse woody debris to other stands or streams).
- Leave in the stand any cut trees >16" dbh (trees >12" dbh will rarely be selected for cutting).
- Remove cut trees <16" dbh as necessary to reduce risk of fire or insect infestation.
- This prescription will generally be applied to stands in which the smaller diameter trees are not expected to respond to increased growing space (e.g., high-density stands that were not pre-commercially thinned).
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

ACTION: Among stands aged 31 to 50 years, thin 50% of acres of Douglas-fir stands in riparian zone (i.e., <100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention within approximately even spacing to maximize individual tree growth.
- Generally leave all cut trees in the stand. Some removal may be needed to mitigate fire risk in limited locations, such as near roads.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Generally limit the cutting of trees >12" dbh to lessen the risk of Douglas-fir bark beetle infestation. (Some trees >12" dbh will be specifically selected for snag and/or coarse woody debris creation). Where some cutting of trees >12" dbh would be needed to achieve target stand densities, lessen the risk of Douglas-fir bark beetle infestation by falling trees in the summer, removing some cut trees, or leaving part of the stand unthinned.
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.
- Lessen fire risk from thinning by not creating high fuel loads near roads. Appropriate mitigations include measures such as removing cut trees from the stand; pulling-back cut trees from road edge; hand-piling and burning cut trees; or leaving part of the stand unthinned.
- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 25% (50% of stands; 50% of acres) of the 51-60-year age class, so that tree densities range from 40-110 TPA by age 61.

ACTION: Among stands aged 51 to 60 years, thin approximately ½ of stands in uplands (i.e., >100' from streams) to a treated stand average of 40-60 Douglas-fir trees per acre, with variable spacing.

ACTION: Among stands aged 51 to 60 years, thin approximately ½ of stands in uplands (i.e., >100' from streams) to a treated stand average of 60-80 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on a combination of thinning from below (i.e., cutting smaller diameter trees) and proportional thinning amongst the larger diameter trees (cutting trees in approximate proportion to their abundance). This prescription will be expected to (1) cut most trees that are not expected to respond to increased growing space and (2) cut in a random or highly variable pattern some of those trees that are expected to respond to increased growing space (e.g., trees with larger diameter, lower height:diameter ratio, greater percentage of live crown, etc.).
- Do not select trees >20" dbh for cutting in the thinning prescription (some trees >20" dbh will be cut to meet coarse woody debris objectives). Do not harvest any trees >20" dbh felled for safety or operational reasons (though trees may be moved to provide coarse woody debris to other stands or streams).
- Remove cut trees <20" dbh as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary.
- Retain existing snags and coarse woody debris, except for safety or operational reasons.
- Retain in the stand any snags felled for safety or operational reasons.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.
- Generally avoid thinning within 1.5 miles of owl activity centers that currently have less than 40% suitable habitat.
- Generally avoid thinning in stands that have large residual trees, large snags, and a wide range of tree heights, because such stands may provide roosting and foraging habitat for northern spotted owls. Thinning should generally be done only in stands that exhibit a homogeneous stand structure.
- Generally avoid thinning stands with little or no late-successional forest within approximately one mile.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.
- Evaluate stands ≥51 years old with older remnant trees for potential marbled murrelet habitat. Survey potential habitat or leave untreated.

ACTION: Among stands aged 51 to 60 years, thin 25% of Douglas-fir stands in riparian zone (i.e., <100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention within approximately even spacing to maximize individual tree growth. (In addition to the thinning prescription, fall or pull trees if available to provide stable in-stream structure

(generally $0.6 \text{ TPA} \geq 24'' \text{ dbh}$)).

- Leave all cut trees in the stand.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.
- Generally limit the cutting of trees $>12'' \text{ dbh}$ to lessen the risk of Douglas-fir bark beetle infestation. (Some trees $>12'' \text{ dbh}$ will be specifically selected for snag and/or coarse woody debris creation). Where some cutting of trees $>12'' \text{ dbh}$ would be needed to achieve target stand densities, lessen the risk of Douglas-fir bark beetle infestation by falling trees in the summer, removing some cut trees, or leaving part of the stand unthinned.
- Lessen fire risk from thinning by not creating high fuel loads near roads. Appropriate mitigations include measures such as removing cut trees from the stand; pulling-back cut trees from road edge; hand-piling and burning cut trees; or leaving part of the stand unthinned.
- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.
- Evaluate stands ≥ 51 years old with older remnant trees for potential marbled murrelet habitat. Survey potential habitat or leave untreated.

ACTION: Renovate existing roads and construct new spur roads as needed to access areas selected for thinning.

GUIDELINES:

- Minimize length of new spur road construction. New spur roads will generally be less than 200' in length.
- Minimize cut and fill in spur road construction. Approximate pre-construction land contour in decommissioning.

MITIGATION MEASURES:

- Do not construct new permanent spur roads.
- Do not construct new spur roads within Riparian Reserves, and do not construct new stream crossings.
- Limit temporary spur road use to a single logging season and decommission spur roads at the end of the logging season (i.e., before the beginning of winter rains).
- Do not construct any new spur roads in stands >80 years old.
- Subsoil temporary roads upon completion of project as needed to reduce soil compaction.
- Block decommissioned roads to restrict vehicular access.

OBJECTIVE: In stands treated under the above objectives, develop densities of shade-tolerant conifers to ensure that by age 81, they contain densities similar to those found in mature natural stands (26-90 TPA >2" dbh).

ACTION: Within stands that are thinned to below 110 TPA at ages 21-30 and lack sufficient shade-tolerant conifer trees or seedlings to meet the objective, plant seedlings of shade-tolerant conifers (western hemlock, western red-cedar, grand fir, incense-cedar and/or Pacific yew) at densities of 26-200 trees per acre.

ACTION: Within stands that are thinned to below 80 TPA at ages 31-60 and lack sufficient shade-tolerant conifer trees or seedlings to meet the objective, plant seedlings of shade-tolerant conifers (western hemlock, western red-cedar, grand fir, incense-cedar and/or Pacific yew) at densities of 26-200 trees per acre.

GUIDELINES:

- Give preference in planting to areas with the greatest likelihood of seedling establishment and growth, considering factors such as post-thinning overstory density and shrub competition.
- Planting may be concentrated in distribution in response to site-specific conditions and need not be evenly distributed across the stand. Planting densities should generally be met at the scale of 10 acres (e.g., 260-2000 trees/10 acres).

OBJECTIVE: In stands treated under the above objectives, develop quantities of snags and coarse woody debris to ensure that by age 81, they contain amounts consistent with Alternative #2 in the LSR Assessment (1102-3794 cu. ft./acre).

ACTION: In thinned stands in which some cut trees are removed and coarse woody debris needs are not being met, leave sufficient felled trees as coarse woody debris to meet stand average coarse woody debris levels of at least 551 cu.ft./acre.

GUIDELINES:

- Coarse woody debris levels should be met at the approximate time of thinning operations.
- Coarse woody debris may be concentrated in distribution and need not be evenly distributed across the stand. Coarse woody debris levels should generally be met at the scale of 10 acres (e.g., 5510 cu.ft./10 acres). Individual coarse woody debris patches (i.e., areas in which all Douglas-fir trees are cut) should generally be limited to less than 1/4 acre in size.
- At least half of the volume of coarse woody debris target (i.e., 276 cu.ft./acre) should be from trees of diameters greater than the pre-treatment stand average diameter.

ACTION: In thinned stands in which some cut trees are removed and snag needs are not being met, create sufficient snags to meet stand average snag levels of at least 551 cu.ft./acre. Snags may be created by a variety of methods, including girdling, topping, blasting, and/or fungal inoculation.

GUIDELINES:

- Snag creation may be done at the time of thinning or delayed to allow time to assess natural tree mortality levels following thinning. Regardless, snag levels should be met within 5 years of the thinning operations, or within 10 years for stands thinned at ages 21-30 years.

- Snags may be concentrated in distribution and need not be evenly distributed across the stand. Snag levels should generally be met at the scale of 10 acres (e.g., 5510 cu.ft./10 acres). Individual snag patches (i.e., areas in which all Douglas-fir trees are killed) should generally be limited to less than 1/4 acre in size.
- At least half of the trees left for snags should have diameters greater than the pre-treatment stand average diameter.

GOAL 3: Reconnect streams and reconnect stream channels to their riparian zones and upslope areas within LSR 267.

OBJECTIVE: Decommission or improve all roads capable of delivering sediment to streams, as identified in watershed analysis within 10 years.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINES:

- Decommissioning may include any of the following measures:
 - discontinuing road maintenance;
 - tilling the road surface with dozer and subsoiler implement or a track mounted excavator;
 - removing gravel or pulling of gravel into the ditch line;
 - scarifying roads for creation of planting areas;
 - removing side cast soils from fill slopes with a high potential for triggering landslides;
 - filling and contouring of cut slope ditch lines to the adjacent hill slope;
 - removing culverts;
 - stabilizing stream crossings (e.g., recontouring stream channels, placement of mulch or mats and seeding for erosion control, placement of rock and logs);
 - installing water bars, cross sloping or drainage dips to ensure adequate drainage into vegetated areas and away from streams or unstable road fills;
 - blocking the road using barricades, gating, or earth berm barriers;
 - placing slash, boulders, and/or woody debris on the road surface to deflect runoff, discourage OHV use, and promote vegetative growth;
 - seeding or planting for erosion control.
- Along roads being decommissioned, generally remove culverts and recontour stream channel to achieve streambank stability.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned road as needed to restrict vehicular traffic.

OBJECTIVE: On roads that will not be decommissioned, reduce the risk to the aquatic ecosystem attributable to the road network within 10 years.

ACTION: Eliminate all barriers to movements of anadromous fish attributable to BLM-controlled roads.

GUIDELINES:

- Barriers may be eliminated by removal, replacement, or modification of culverts, and/or installation of downstream structures to raise upstream water levels within culverts or upstream structure to stabilize accumulated deposition.

ACTION: Develop and implement Memoranda of Understanding with adjacent road- and land-owners to eliminate barriers to movements of anadromous fish attributable to non-BLM roads or lands.

ACTION: Remove or replace culverts that have a high risk of failure.

GUIDELINES:

- Along roads that will not be decommissioned, replace existing culverts that are failed, undersized, or constitute passage barriers. An existing culvert may be replaced with another culvert, a half-arch or a bridge.
- For culverts creating a passage barrier, where removal or replacement are not feasible, access to the culvert may be created or improved by downstream log or boulder structure designed to elevate the stream channel and create pools to facilitate movement into the culvert. Downstream structures may also be used in conjunction with culvert replacement to improve passage.

OBJECTIVE: Increase stream structure to >160 pieces/stream mile of woody debris (>6" diameter, 10' long) on all 1st and 2nd order streams adjacent to stands ≤80 years old, and >30 structures/stream mile along 3.8 miles of 3rd, 4th, or 5th-order streams within 10 years.

ACTION: Construct woody debris structures with at least 3 key pieces/structure in 3rd, 4th, or 5th-order streams.

GUIDELINES:

- Key pieces should generally be greater than 50' long and ≥24" diameter.
- Cable or otherwise stabilize structures as needed in streams that are devoid of existing stable structure that has the potential to accumulate future woody debris recruitment.
- Consider yarding logs into the stream from nearby thinning operations.
- Wood imported from off-site (e.g., purchased logs or any other logs not from adjacent or nearby stands) should generally be used in structures on 4th and 5th-order streams.

ACTION: In riparian stands ≤80 years old that are not thinned under the thinning objective below, fall or pull over trees into the stream to increase levels to >160 pieces/stream mile of woody debris (>6" diameter, 10' long).

GUIDELINES:

- On streams with no existing woody debris, cut 160 trees >6" dbh/stream mile (approximately 25 trees/acre). If available, fall or pull trees to provide stable in-stream structure (generally 0.6 TPA ≥24" dbh).
- In conifer-dominated stands, generally select Douglas-fir for falling or pulling. In hardwood-dominated stands, generally select red alder and bigleaf maple for falling or cutting.
- In conifer-dominated stands, generally do not fall or pull more than one tree/acre from the largest 10% of diameter classes in the stand.

- In hardwood-dominated stands, some conifers may be felled or pulled, but generally do not fall or pull more than half of the conifer trees (at the scale of one acre).
- Do not fall or pull conifers $\geq 32"$ dbh.
- Do not cut trees on immediate streambank that are contributing to streambank stability.

OBJECTIVE: In 55% of riparian (<100' from stream) Douglas-fir stands 21-60 years old, attain conifer densities of ≥ 13 TPA $\geq 24"$ dbh by age 80.

ACTION: Among stands aged 21 to 30 years, thin 75% of acres of Douglas-fir stands in riparian zone (i.e., <100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

ACTION: Among stands aged 31 to 50 years, thin 50% of acres of Douglas-fir stands in riparian zone (i.e., <100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

ACTION: Among stands aged 51 to 60 years, thin 25% of Douglas-fir stands in riparian zone (i.e., <100' from streams) to a treated stand average of 60-110 Douglas-fir trees per acre.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Thin from below: select the largest, most vigorous trees for retention within approximately even spacing to maximize individual tree growth.
- Generally leave all cut trees in the stand. Some removal may be needed to mitigate risk in limited locations, such as near roads.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.
- Generally limit the cutting of trees $>12"$ dbh to lessen the risk of Douglas-fir bark beetle infestation. (Some trees $>12"$ dbh will be specifically selected for snag and/or coarse woody debris creation). Where some cutting of trees $>12"$ dbh would be needed to achieve target stand densities, lessen the risk of Douglas-fir bark beetle infestation by falling trees in the summer, removing some cut trees, or leaving part of the stand unthinned.
- Lessen fire risk from thinning by not creating high fuel loads near roads. Appropriate mitigations include measures such as removing cut trees from the stand; pulling-back cut trees from road edge; hand-piling and burning cut trees; or leaving part of the stand unthinned.

OBJECTIVE: In 50% of riparian (<100' from stream) hardwood-dominated stands, attain conifer densities of ≥ 13 TPA $\geq 24"$ dbh by age 101-131 (or approximately 80 years after treatment).

ACTION: Cut hardwoods and shrubs to provide growing space for conifers in hardwood-dominated stands in riparian zone (i.e., <100' from streams).

GUIDELINES:

- Cut or girdle competing hardwoods and shrubs to release existing conifer saplings or to create planting sites for conifers
- Select for cutting primarily red alder and tall shrubs, such as salmonberry, that compete aggressively with conifer saplings.
- Some trees may be girdled instead of cut to create snags.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

ACTION: Plant conifer seedlings and/or saplings in hardwood-dominated stands that were treated under the previous action and lack sufficient conifers to meet objective densities.

GUIDELINES:

- Species planted will be primarily western red-cedar and Douglas-fir, but may also include western hemlock and grand fir, depending on specific site conditions.
- Give preference in planting to areas with the greatest likelihood of conifer establishment and growth, considering factors such as soil conditions, overstory density and shrub competition.
- Planting may be concentrated in distribution in response to site-specific conditions and need not be evenly distributed across the stand.
- Tube western red-cedar seedlings to reduce browsing.
- Control competing shrub vegetation by placing mats or mulch around the trees or by cutting competing shrubs at planting and during subsequent years as needed to establish trees.

ALTERNATIVE E

Reduce Stand Densities as Quickly as Possible

Achieve tree densities typical of late-successional forests as soon as possible regardless of short-term impacts

GOAL 1: Protect and enhance late-successional and old-growth forest ecosystems.

OBJECTIVE: On decommissioned and BLM-controlled roads, control noxious weeds within 10 years sufficient to ensure they do not penetrate into late-successional stands.

ACTION: Inventory roads within or adjacent to late-successional stands for the presence of noxious weeds.

ACTION: Remove noxious weeds from BLM-controlled roads, including roads to be decommissioned.

ACTION: Plant trees or other native species in the decommissioned roads to prevent noxious weeds from becoming established in areas where weed seed is likely to spread into the decommissioned roads.

GUIDELINE:

- Use methods to remove weeds such as mowing, pulling, cutting and grubbing depending on the weed species.

OBJECTIVE: Decommission non-shared, BLM-controlled roads in the next 10 years within or adjacent to late-successional stands.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINE:

- In determining the timing for decommissioning, consider whether the road would provide access for other management actions.

ACTION: Decommission unnumbered roads and non-designated trails as needed to protect and enhance late-successional forests.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on the decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned roads as needed to restrict vehicular traffic.

GOAL 2: Foster the development of late-successional forest structure and composition in plantations and young forests within LSR 267.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 90% (100% of stands; 90% of acres) of the 1-20-year age class, so that tree densities range from 31-46 TPA by age 21.

ACTION: Thin stands aged 15 to 20 years to a stand average of 31-46 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on random or highly variable spacing.
- Leave most or all cut trees in the stand.

MITIGATION MEASURES:

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 10') of stands to restrict spread of noxious weeds.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 75% (100% of stands; 75% of acres) of the 21-30-year age class, so that tree densities range from 31-46 TPA by age 31.

ACTION: Thin stands aged 21 to 30 years to a treated stand average of 31-46 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on random or highly variable spacing. Select trees amongst diameter classes approximately in proportion to their abundance.
- Leave in the stand any cut trees >16" dbh.
- Remove cut trees ≤16" dbh as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary in stands that have been pre-commercially thinned more than 8 years ago and are more than 23 years old.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 25') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 75% (100% of stands; 75% of acres) of the 31-50-year age class, so that tree densities range from 31-46 TPA by age 51.

ACTION: Thin stands aged 31 to 50 years to a treated stand average of 31-46 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on random or highly variable spacing. Select trees amongst diameter classes approximately in proportion to their abundance amongst diameter classes.
- Remove cut trees ≤ 20 " dbh as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary.
- Do not harvest any trees > 20 " dbh felled for safety or operational reasons (though trees may be moved to provide coarse woody debris to other stands or streams).
- Retain existing snags and coarse woody debris, except for safety and operational reasons.
- Retain in the stand any snags felled for safety or operational reasons.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.
- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 25') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.

OBJECTIVE: Reduce tree density and increase variability of tree spacing in 25% (50% of stands; 50% of acres) of the 51-80-year age class, so that tree densities range from 31-46 TPA by age 81.

ACTION: Thin stands aged 51 to 80 years to a treated stand average of 31-46 Douglas-fir trees per acre, with variable spacing.

GUIDELINES:

- Select only Douglas-fir for cutting.
- Select trees for retention based on a combination of thinning from below (i.e., cutting smaller diameter trees); proportional thinning amongst the larger diameter trees (cutting trees in approximate proportion to their abundance); and retention of the largest trees. This prescription will be expected to (1) cut most trees that are not expected to respond to increased growing space and (2) cut in a random or highly

variable pattern some of those trees that are expected to respond to increased growing space (e.g., trees with larger diameter, lower height:diameter ratio, greater percentage of live crown, etc.). Generally select for retention all of the largest 5% of the tree diameter distribution.

- Remove cut trees <20" dbh as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary.
- Do not harvest any trees >20" dbh felled for safety or operational reasons (though trees may be moved to provide coarse woody debris to other stands or streams).
- Retain existing snags and coarse woody debris of decay classes, except for safety and operational reasons.
- Retain in the stand any snags felled for safety or operational reasons.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.
- Generally avoid thinning within 1.5 miles of owl activity centers.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.
- Along areas (such as roadsides and adjacent clearcuts) with noxious weed problems, do not thin along edge (approximately 25') of stands to restrict spread of noxious weeds. Some tree cutting will be necessary to provide operational access.
- Evaluate stands ≥51 years old with older remnant trees for potential marbled murrelet habitat. Survey potential habitat or leave untreated.

ACTION: Construct new roads or renovate existing roads as needed to access areas identified as suitable for thinning.

GUIDELINES:

- Where new stream crossings are required, use temporary roads that are decommissioned after a single logging season.

MITIGATION MEASURES:

- Waterbar temporary roads between logging seasons.
- Subsoil temporary roads upon completion of project as needed to reduce soil compaction.
- Block decommissioned roads to restrict vehicular access.

OBJECTIVE: In stands treated under the above objectives, develop densities of shade-tolerant conifers to ensure that by age 81, they contain densities similar to those found in mature natural stands (26-90 TPA >2" dbh).

ACTION: Within thinned stands that lack sufficient shade-tolerant conifer trees or seedlings to meet the objective, plant seedlings of shade-tolerant conifers (western hemlock, western red-cedar, grand fir, incense-cedar and/or Pacific yew) at densities of 26-200 trees per acre.

GUIDELINES:

- Give preference in planting to areas with the greatest likelihood of seedling establishment and growth, considering factors such as post-thinning overstory density and shrub competition.
- Planting may be concentrated in distribution in response to site-specific conditions and need not be evenly distributed across the stand. Planting densities should generally be met at the scale of 10 acres (e.g., 260-2000 trees/10 acres).

OBJECTIVE: In stands treated under the above objectives, develop quantities of snags and coarse woody debris to ensure that by age 81, they contain amounts consistent with Alternative #2 in the LSR Assessment (1102-3794 cu. ft./acre).

ACTION: In thinned stands in which some cut trees are removed and coarse woody debris needs are not being met, leave sufficient felled trees as coarse woody debris to meet stand average coarse woody debris levels of at least 551 cu.ft./acre.

GUIDELINES:

- Coarse woody debris levels should be met at the approximate time of thinning operations.
- Coarse woody debris may be concentrated in distribution and need not be evenly distributed across the stand. Coarse woody debris levels should generally be met at the scale of 10 acres (e.g., 5510 cu.ft./10 acres). Individual coarse woody debris patches (i.e., areas in which all Douglas-fir trees are felled) should generally be limited to less than 1/4 acre in size.
- At least half of the volume of coarse woody debris target (i.e., 276 cu.ft./acre) should be from trees of diameters greater than the pre-treatment stand average diameter.

ACTION: In thinned stands in which some cut trees are removed and snag needs are not being met, create sufficient snags to meet stand average snag levels of at least 551 cu.ft./acre. Snags may be created by a variety of methods, including girdling, topping, blasting, and/or fungal inoculation.

GUIDELINES:

- Snag creation may be done at the time of thinning or delayed to allow time to assess natural tree mortality levels following thinning. Regardless, snag levels should be met within 5 years of the thinning operations.
- Snags may be concentrated in distribution and need not be evenly distributed across the stand. Snag levels should generally be met at the scale of 10 acres (e.g., 5510 cu.ft./10 acres). Individual snag patches (i.e., areas in which all Douglas-fir trees are killed) should generally be limited to less than 1/4 acre in size.
- At least half of the trees left for snags should have diameters greater than the pre-treatment stand average diameter.

GOAL 3: Reconnect streams and reconnect stream channels to their riparian zones and upslope areas within LSR 267.

OBJECTIVE: Decommission or improve all roads capable of delivering sediment to streams, as identified in watershed analysis within 10 years.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINES:

- Decommissioning may include any of the following measures:
 - discontinuing road maintenance;
 - tilling the road surface with dozer and subsoiler implement or a track mounted excavator;
 - removing gravel or pulling of gravel into the ditch line;
 - scarifying roads for creation of planting areas;
 - removing side cast soils from fill slopes with a high potential for triggering landslides;
 - filling and contouring of cut slope ditch lines to the adjacent hill slope;
 - removing culverts;
 - stabilizing stream crossings (e.g., recounering stream channels, placement of mulch or mats and seeding for erosion control, placement of rock and logs);
 - installing water bars, cross sloping or drainage dips to ensure adequate drainage into vegetated areas and away from streams or unstable road fills;
 - blocking the road using barricades, gating, or earth berm barriers;
 - placing slash, boulders, and/or woody debris on the road surface to deflect runoff, discourage OHV use, and promote vegetative growth;
 - seeding or planting for erosion control.
- Along roads being decommissioned, generally remove culverts and recontour stream channels to achieve streambank stability.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.
- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned road as needed to restrict vehicular traffic.

OBJECTIVE: On roads that will not be decommissioned, reduce the risk to the aquatic ecosystem attributable to the road network within 10 years.

ACTION: Eliminate all barriers to movements of anadromous fish and aquatic organisms attributable to BLM-controlled roads.

GUIDELINES:

- Barriers may be eliminated by removal, replacement, or modification of culverts, and/or installation of downstream structures to raise upstream water levels within culverts or upstream structure to stabilize accumulated deposition.

ACTION: Develop and implement Memoranda of Understanding with adjacent road- and land-owners to eliminate barriers to movements of anadromous fish and other aquatic organisms attributable to non-BLM roads or lands.

ACTION: Remove or replace culverts that have a high risk of failure.

GUIDELINES:

- Along roads that will not be decommissioned, replace existing culverts that are failed, undersized, or constitute passage barriers. An existing culvert may be replaced with another culvert, a half-arch or a bridge.
- For culverts creating a passage barrier, where removal or replacement are not feasible, access to the culvert may be created or improved by downstream log or boulder structure designed to elevate the stream channel and create pools to facilitate movement into the culvert. Downstream structures may also be used in conjunction with culvert replacement to improve passage.

OBJECTIVE: Increase stream structure to >160 pieces/stream mile of woody debris (>6" diameter, 10' long) on all streams adjacent to stands <80 years old, including >16 large pieces/stream mile (>24" diameter, 32' long)/mile on 5.8 miles of 3rd-order streams and larger within 10 years.

ACTION: In riparian stands ≤80 years old that are not thinned under the thinning objectives, fall or pull over trees into the stream to increase levels to >160 pieces/stream mile of woody debris (>6" diameter, 10' long) including >16 large pieces/stream mile (≥24" diameter, 32' long)/stream mile on 3rd-order or larger streams.

GUIDELINES:

- On streams with no existing woody debris, cut 160 trees >6" dbh/stream mile (approximately 12-25 trees/acre) including >16 large pieces/stream mile (≥24" diameter, 32' long)/mile on 3rd-order or larger streams if available.
- Where sufficient trees are not available to increase levels to >16 large pieces/stream mile of woody debris (>24" diameter, 32' long) on 3rd-order or larger streams, bring logs from off-site and place in stream. Consider yarding logs into the stream from nearby thinning operations.
- In conifer-dominated stands, generally select Douglas-fir for falling or pulling. In hardwood-dominated stands, generally select red alder and bigleaf maple for falling or cutting.
- In conifer-dominated stands, generally do not fall or pull more than one tree/acre from the largest 10% of diameter classes in the stand.
- In hardwood-dominated stands, some conifers may be felled or pulled, but generally do not fall or pull more than half of the conifer trees (at the scale of one acre).
- Do not cut trees on immediate streambank that are contributing to streambank stability.

OBJECTIVE: In 75% (100% of stands; 75% of acres) of riparian (<100' from stream) hardwood-dominated stands, attain conifer densities of 19-51 TPA free-to-grow (i.e., conifer heights at or above hardwood canopy level) by age 81.

ACTION: Cut hardwoods and shrubs to provide growing space for conifers in hardwood-dominated stands in riparian zone (i.e., <100' from streams).

GUIDELINES:

- Cut or girdle competing hardwoods and shrubs to release existing conifer saplings or to create planting sites for conifers
- Select for cutting primarily red alder and tall shrubs, such as salmonberry, that compete aggressively with conifer saplings.
- Some trees may be girdled instead of cut to create snags.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

ACTION: Plant conifer seedlings and/or saplings in hardwood-dominated stands that were treated under the previous action and lack sufficient conifers to meet objective densities.

GUIDELINES:

- Species planted will be primarily western red-cedar and Douglas-fir, but may also include western hemlock and grand fir, depending on specific site conditions.
- Give preference in planting to areas with the greatest likelihood of conifer establishment and growth, considering factors such as soil conditions, overstory density and shrub competition.
- Planting may be concentrated in distribution in response to site-specific conditions and need not be evenly distributed across the stand.
- Tube western red-cedar seedlings to reduce browsing.
- Control competing shrub vegetation by placing mats or mulch around the trees or by cutting competing shrubs at planting and during subsequent years as needed to establish trees.

ALTERNATIVE F

Multi-Entry and Multi-Trajectory Thinning

Maintain stand vigor by increasing growing space, developing wind firmness, and maintaining crown development, while maintaining canopy closure

GOAL 1: Protect and enhance late-successional and old-growth forest ecosystems.

OBJECTIVE: On decommissioned and BLM-controlled roads, control noxious weeds within 10 years sufficient to ensure they do not penetrate into late-successional stands.

ACTION: Inventory roads within or adjacent to late-successional stands for the presence of noxious weeds.

ACTION: Remove noxious weeds from BLM-controlled roads, including roads to be decommissioned.

ACTION: Plant trees or other native species in the decommissioned roads to prevent noxious weeds from becoming established in areas where weed seed is likely to spread into the decommissioned roads.

GUIDELINE:

- Use methods to remove weeds such as mowing, pulling, cutting and grubbing depending on the weed species.

OBJECTIVE: Decommission or close and stabilize non-shared, BLM-controlled roads that (1) are capable of delivering sediment to streams, (2) are damaged and not needed for future access, or (3) dead-end in late-successional stands.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINE:

- In determining the timing for decommissioning, consider whether the road would provide access for other management actions.

ACTION: Decommission unnumbered roads and non-designated trails as needed to protect and enhance late-successional forests.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.

Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on the decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned roads as needed to restrict vehicular traffic.

GOAL 2: Foster the development of late-successional forest structure and composition in plantations and young forests within LSR 267.

OBJECTIVE: Reduce tree density in 90% of the 10-24-year age class so that tree densities range from 105-250 TPA by age 25.

ACTION: Thin 27% of stands aged 10-24 years old that have not been pre-commercially thinned or that have more than 220 well-spaced trees per acre to 105-150 TPA.

ACTION: Thin 25% of stands aged 10-24 years old that have not been pre-commercially thinned or that have more than 220 well-spaced trees per acre to 135-220 TPA.

ACTION: Thin 13% of stands aged 10-24 years old that have not been pre-commercially thinned or that have more than 250 well-spaced trees per acre to 150-250 TPA.

ACTION: Thin 25% of stands aged 10-24 years old that have not been pre-commercially thinned or that have more than 250 well-spaced trees per acre to 165-240 TPA.

GUIDELINES:

- Select the largest, most vigorous trees for retention within overall even spacing.
- Leave most or all cut trees in the stand.
- Retain most minor conifers (i.e., western hemlock, western red-cedar, grand fir, and incense-cedar) as part of the overall conifer spacing, giving greater preference to minor conifers when they are more scarce.
- Retain most larger hardwoods (typically retain hardwoods >12" dbh).
- Generally avoid thinning within 10' of perennial streams.

OBJECTIVE: Reduce tree density in 47% of the 25-39-year age class, so that tree densities range from 60-135 TPA by age 40.

ACTION: Thin 7% of stands aged 25 to 39 years old that have more than 150 well-spaced trees per acre to 60-75 TPA.

ACTION: Thin 7% of stands aged 25 to 39 years old that have more than 150 well-spaced trees per acre to 60-105 TPA.

ACTION: Thin 7% of stands aged 25 to 39 years old that have more than 250 well-spaced trees per acre to 75-125 TPA.

ACTION: Thin 13% of stands aged 25 to 39 years old that have more than 150 well-spaced trees per acre to 80-125 TPA.

ACTION: Thin 13% of stands aged 25 to 39 years old that have more than 210 well-spaced trees per acre to 90-135 TPA.

GUIDELINES:

- Thin from below: select the largest, most vigorous trees for retention.
- Retain most minor conifers (e.g., western hemlock, western red-cedar, grand fir, and incense-cedar) and hardwoods.
- Generally use the higher density prescriptions (i.e., >75 TPA) within 50' of streams.
- Remove cut trees as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary.
- Retain existing snags and coarse woody debris of decay classes 3, 4, and 5, except for safety or operational reasons.
- Retain in the stand any snags felled for safety or operational reasons.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling or pulling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

OBJECTIVE: Reduce tree density in 24% of the 40-80-year age class, so that tree densities range from 35-105 TPA by age 81.

ACTION: Thin 4% stands aged 40 to 80 years that have less than 210 trees per acre to a treated stand average of 35-55 trees per acre.

ACTION: Thin 4% stands aged 40 to 80 years that have less than 210 trees per acre to a treated stand average of 55-65 trees per acre.

ACTION: Thin 4% stands aged 40 to 80 years that have less than 210 trees per acre to a treated stand average of 55-75 trees per acre.

ACTION: Thin 6% stands aged 40 to 80 years that have less than 210 trees per acre to a treated stand average of 65-85 trees per acre.

ACTION: Thin 6% stands aged 40 to 80 years that have less than 210 trees per acre to a treated stand average of 65-105 trees per acre.

GUIDELINES:

- Thin from below: select the largest, most vigorous trees for retention.
- Retain most minor conifers (e.g., western hemlock, western red-cedar, grand fir, and incense-cedar) and hardwoods.
- Maintain >55 TPA within 100' of streams.
- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Remove cut trees as necessary to reduce risk of fire or insect infestation. Some removal will generally be necessary, except do not remove trees cut within 25' of streams or felled to within 25' of streams.
- Retain existing snags and coarse woody debris of decay classes 3, 4, and 5, except for safety or operational reasons.
- Retain in the stand any snags felled for safety or operational reasons.
- Target stand densities should be reached after completion of coarse woody debris and snag creation done under objectives below.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling or pulling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.
- Evaluate stands ≥ 51 years old with older remnant trees for potential marbled murrelet habitat. Survey potential habitat or leave untreated.

ACTION: Construct new roads or renovate existing roads as needed to access areas identified as suitable for thinning.

GUIDELINES:

- Generally construct only temporary roads.

MITIGATION MEASURES:

- Do not build new roads in stands >80 years old.
- Waterbar temporary roads between logging seasons.
- Decommission roads upon completion of final stand thinning.
- Block decommissioned roads to restrict vehicular access.

OBJECTIVE: In stands treated under the above objectives, develop densities of shade-tolerant conifers to ensure that by age 81, they contain densities similar to those found in mature natural stands (26-90 TPA $>2"$ dbh).

ACTION: Within thinned stands that lack sufficient shade-tolerant conifer trees or seedlings to meet the objective, plant seedlings of shade-tolerant conifers (western hemlock, western red-cedar, grand fir, incense-cedar and/or Pacific yew) at densities of 26-200 trees per acre.

GUIDELINES:

- Give preference in planting to areas with the greatest likelihood of seedling establishment and growth, considering factors such as post-thinning overstory density and shrub competition.
- Planting may be concentrated in distribution in response to site-specific conditions and need not be evenly distributed across the stand. Planting densities should generally be met at the scale of 10 acres (e.g., 260-2000 trees/10 acres).

OBJECTIVE: In stands treated under the above objectives, develop quantities of snags and coarse woody debris to ensure that by age 81, they contain amounts consistent with Alternative #3 in the LSR Assessment (525-2844 cu. ft./acre).

ACTION: Cut and leave 3-15 Douglas-fir trees per acre as coarse woody debris (approximately 100-500 cu.ft./acre) in stands thinned at ages 40-80 in which coarse woody debris needs are not being met.

ACTION: Create snags by killing 1-3 Douglas-fir trees per acre (approximately 30-100 cu.ft./acre) in stands thinned at ages 40-80 in which snag needs are not being met. Snags may be created by a variety of methods, including girdling, topping, blasting, and/or fungal inoculation.

GUIDELINES:

- Snag and coarse woody debris creation may be done at the time of thinning or delayed to allow time to assess natural tree mortality levels following thinning. Regardless, snag and coarse woody debris levels should be met within 10 years of the thinning operations.
- Coarse woody debris and snags may be concentrated in distribution and need not be evenly distributed across the stand. Coarse woody debris and snag levels should generally be met at the scale of 10 acres. Individual coarse woody debris and snag patches (i.e., areas in which all Douglas-fir trees are cut or killed) should generally be limited to less than 1/4 acre in size.

GOAL 3: Reconnect streams and reconnect stream channels to their riparian zones and upslope areas within LSR 267.

OBJECTIVE: Decommission or improve all roads capable of delivering sediment to streams, as identified in watershed analysis within 10 years.

ACTION: Decommission the roads shown in Appendix E.

GUIDELINES:

- Decommissioning may include any of the following measures:
 - discontinuing road maintenance;
 - tilling the road surface with dozer and subsoiler implement or a track mounted excavator;
 - removing gravel or pulling of gravel into the ditch line;
 - scarifying roads for creation of planting areas;
 - removing side cast soils from fill slopes with a high potential for triggering landslides;
 - filling and contouring of cut slope ditch lines to the adjacent hill slope;
 - removing culverts;
 - stabilizing stream crossings (e.g., recontouring stream channels, placement of mulch or mats and seeding for erosion control, placement of rock and logs);
 - installing water bars, cross sloping or drainage dips to ensure adequate drainage into vegetated areas and away from streams or unstable road fills;
 - blocking the road using barricades, gating, or earth berm barriers;
 - placing slash, boulders, and/or woody debris on the road surface to deflect runoff, discourage OHV use, and promote vegetative growth;
 - seeding or planting for erosion control.
- Along roads being decommissioned, generally remove culverts and recontour stream channels to achieve streambank stability.

ACTION: On roads to be decommissioned, break up areas of soil compaction of the road surface (by subsoiling or other such methods) as needed to allow tree establishment and growth.

GUIDELINES:

- Where subsoiling or other such methods will not be sufficient to allow tree establishment and growth, recontour the road area to create better tree growing conditions.

- Coordinate thinning and coarse woody debris creation in adjacent stands to fall some trees across decommissioned roads to cover soil and block access.

ACTION: Plant trees or other native species on decommissioned road surface when needed to ensure tree establishment.

ACTION: Block decommissioned road as needed to restrict vehicular traffic.

OBJECTIVE: On roads that will not be decommissioned, reduce the risk to the aquatic ecosystem attributable to the road network within 10 years.

ACTION: Eliminate all barriers to movements of anadromous fish and aquatic organisms attributable to BLM-controlled roads.

GUIDELINES:

- Barriers may be eliminated by removal, replacement, or modification of culverts, and/or installation of downstream structures to raise upstream water levels within culverts or upstream structure to stabilize accumulated deposition.

ACTION: Develop and implement Memoranda of Understanding with adjacent road- and land-owners to eliminate barriers to movements of anadromous fish and other aquatic organisms attributable to non-BLM roads or lands.

ACTION: Remove or replace culverts that have a high risk of failure.

GUIDELINES:

- Along roads that will not be decommissioned, replace existing culverts that are failed, undersized, or constitute passage barriers. An existing culvert may be replaced with another culvert, a half-arch or a bridge.
- For culverts creating a passage barrier, where removal or replacement are not feasible, access to the culvert may be created or improved by downstream log or boulder structure designed to elevate the stream channel and create pools to facilitate movement into the culvert. Downstream structures may also be used in conjunction with culvert replacement to improve passage.

OBJECTIVE: Increase stream structure to 56 structures/stream mile along 3.8 miles of streams within 10 years.

ACTION: Construct woody debris structures with at least 3 key pieces/structure in 3rd, 4th, or 5th-order streams.

GUIDELINES:

- Key pieces should generally be greater than 50' long and ≥ 24 " diameter.
- Cable or otherwise stabilize structures as needed in streams that are devoid of existing stable structure that has the potential to accumulate future woody debris recruitment.
- Wood imported from off-site (e.g., purchased logs or any other logs not from adjacent or nearby stands) should generally be used in structures on 4th and 5th-order streams.

OBJECTIVE: In 50% of riparian (<100' from stream) hardwood-dominated stands, attain conifer densities of ≥ 13 TPA ≥ 24 " dbh by age 101-131 (or approximately 80 years after treatment).

ACTION: Cut hardwoods and shrubs to provide growing space for conifers in hardwood-dominated stands in riparian zone (i.e., <100' from streams).

GUIDELINES:

- Cut or girdle competing hardwoods and shrubs to release existing conifer saplings or to create planting sites for conifers
- Select for cutting primarily red alder and tall shrubs, such as salmonberry, that compete aggressively with conifer saplings.
- Some trees may be girdled instead of cut to create snags.

MITIGATION MEASURES:

- Do not cut trees on immediate streambank that are contributing to streambank stability.
- Limit falling or pulling of trees directly into streams to approximately 160 trees per stream mile (though this average quantity would likely be very unevenly distributed along any particular stream reach).
- Avoid creating large concentration of fallen trees with intact needles or leaves in stream reaches with poor oxygen reaeration (e.g., high water temperatures, low stream gradient, very slow moving water) during seasons of low stream flow (summer and early fall).
- Maintain sufficient stream shading so as to avoid contributing to increased water temperature.

ACTION: Plant conifer seedlings and/or saplings in hardwood-dominated stands that were treated under the previous action and lack sufficient conifers to meet objective densities.

GUIDELINES:

- Species planted will be primarily western red-cedar and Douglas-fir, but may also include western hemlock and grand fir, depending on specific site conditions.
- Give preference in planting to areas with the greatest likelihood of conifer establishment and growth, considering factors such as soil conditions, overstory density and shrub competition.
- Planting may be concentrated in distribution in response to site-specific conditions and need not be evenly distributed across the stand.
- Tube western red-cedar seedlings to reduce browsing.
- Control competing shrub vegetation by placing mats or mulch around the trees or by cutting competing shrubs at planting and during subsequent years as needed to establish trees.

APPENDIX B

Forest Modeling And The Landscape Management System (LMS)

Introduction

In order to evaluate the consequences of silvicultural actions, we projected the forest landscape forward in time. We had to strike a balance between the precision of the modeling and the scope of the analysis, because of the large size of the landscape, the variety of conditions existing upon that landscape, and the variety of treatments analyzed. For each step in the modeling, we invoked simplifying assumptions to prevent the analysis from expanding beyond a manageable size.

The major steps in the modeling include:

- establishing the starting condition;
- developing the treatment pathways;
- projecting the landscape forward in time using a stand growth model;
- summarizing the results across the landscape; and
- evaluating the results against criteria.

Establishment of the Starting Condition

Available Data

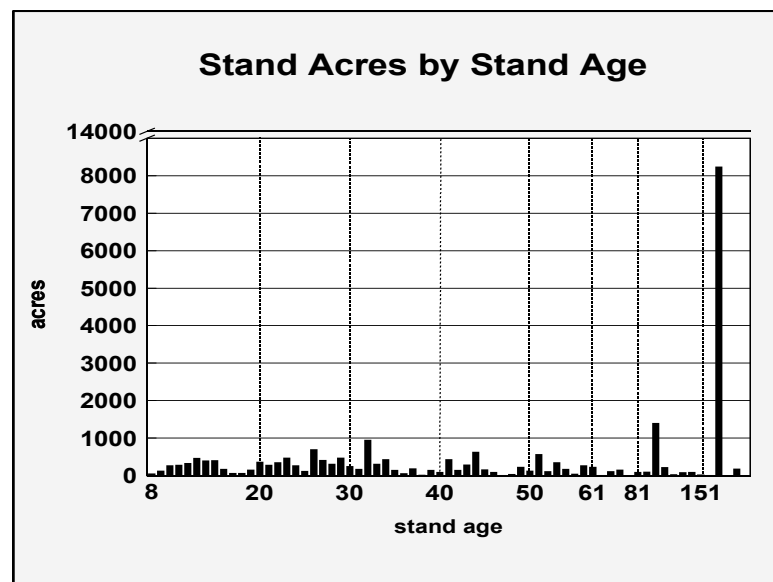
The Eugene District maintains a Geographic Information System (GIS) which, along with the Forest Operations Inventory (FOI), identifies the location and attributes such as age and stand type for each stand in the planning area. The District also maintains the MICRO*STORMS data base, which records the treatment history for all managed stands. These three geographically-based systems are connected through a unique number – the FOI polygon number – which identifies each forest stand. This FOI polygon number and the attributes ascribed to it form the basis of all summary numbers, such as acres of an age-class, acres which have been planted, etc. The starting acres and later stratifications of these acres are all calculated from summaries or intersections of these polygons with various GIS themes, such as stream or road locations.

In addition to these main data systems which are used to develop the landscape application of the silvicultural treatments, various other data exist to assist in the analysis. We used stand exam data, post-pre-commercial thinning exams, stocking exams, and timber sale cruise data to calibrate the analysis at various points.

Stratification

Once the FOI polygons and their acres were compiled by stand birthdate and treatment history (see Graph 45), we stratified the landscape into a series of 15 “type stands”: a generalized stand condition for a given age class and its typical management history. These type stands are surrogates for a group of age classes or birthdates. Reduction of the multitude of stand ages into a smaller set of type stands keeps the application of the treatments to a manageable size. The type stands selected for this analysis are

shown in Table 9. We selected the type stands specifically to narrow the groups for which stands are in a state of rapid structural change. In managed Douglas-fir stands from about 20-60 years of age, tree diameters and heights change dramatically, and stands typically undergo extensive density-dependent mortality ("self-thinning").



Finally, we split all type stands into 2 subgroups: uplands and riparian areas (<100' from streams). Riparian areas were identified based on the Eugene District Hydrological GIS theme. Splitting FOI polygons into upland and riparian stands allowed the modeling of different treatment prescriptions in upland and riparian areas.

Starting inventories

We developed starting stand inventories for type stands ≤ 80 years old using the FVS stand modeler and the typical stand treatment histories. We averaged stand age within the range of the stand type (see Table 9) and assumed the treatment history to be that which was predominant at the time, from the MICRO*STORMS database. We assumed that stands were pre-commercially thinned, with the following exceptions. The DF10 (i.e., 10-year old type stand) has not yet been pre-commercially thinned. We split the DF15 into pre-commercially thinned and non-pre-commercially thinned stands to reflect that pre-commercial thinning is currently underway in this age class. We split the DF40 into pre-commercially thinned and non-pre-commercially thinned stands because a substantial portion of stands in that age-class were not pre-commercial thinned because of inadequate funding.

We developed starting stand inventories for type stands >80 years old from timber cruise data and the FVS stand modeler.

The stands ≤ 80 years old in the planning area are generally high density, uniform in structure, and dominated by Douglas-fir. Although hardwood stands are present in the planning area, they are generally confined to the immediate riparian areas of larger streams and comprise less than 4% of all typed stands. Simplifying this forest landscape into a series of 15 type stands with a single starting inventory for each type stand permits the modeling of change to forests over time across a large landscape under multiple alternatives.

The starting stand inventories we used appear to slightly underestimate tree diameter and height. BLM is currently conducting a series of stand examinations in and near the planning area, to evaluate the starting stand inventories.

Development of the Silvicultural Pathways

For each alternative, we developed silvicultural pathways which applied the treatments to appropriate type stands. These silvicultural pathways include both treatments within the 10-year plan period, and subsequent treatments which would occur until the stands are >80 years old. See Figure 1 for an example of a treatment pathway. Treatments include thinning, underplanting, falling trees for coarse woody debris, and killing trees for snags.

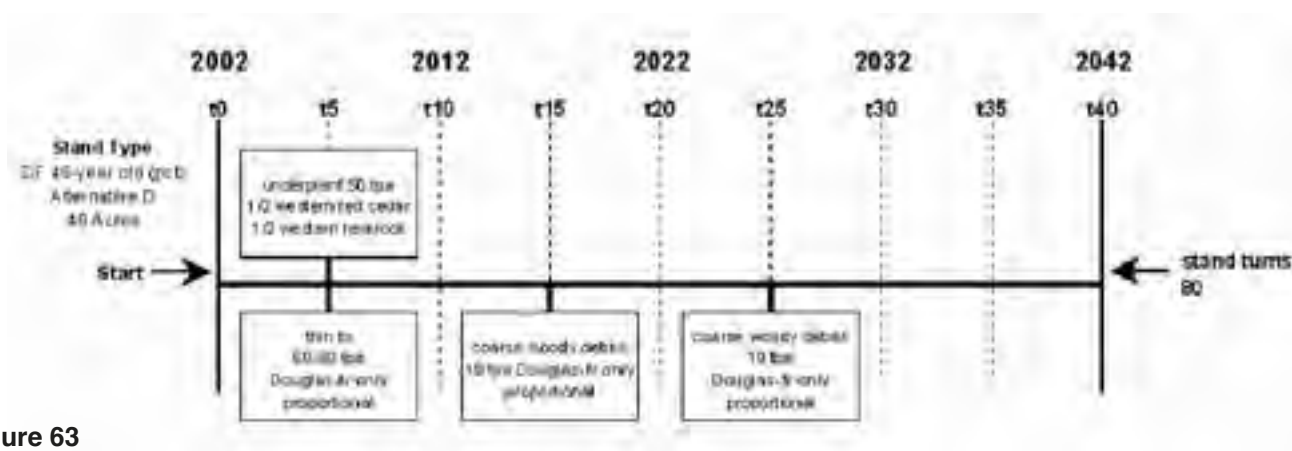


Figure 63

A number of simplifying assumptions were necessary to prevent an unmanageable proliferation of pathways. First, we averaged thinning prescriptions that specified a range of tree densities (e.g., 50 - 70 TPA was modeled as 60 TPA). Second, we applied treatments at no less than 5-year intervals, which coincides with the minimum time increment of the stand model. Third, the analysis assumes that there would be no natural establishment of new trees. Fourth, the analysis does not provide for natural disturbance events, such as fires or windstorms.

There are two important limitations of the modeling with regard to the silvicultural pathways. First, the model applies thinning evenly at the indicated density, even though several alternatives in the analysis specify variable spacing. There are no comparable stand models available which can model thinning in a spatially explicit manner. Therefore the changes in point-to-point density in spatially variable treatments have to be inferred from the overall stand data. Second, the model does not include hardwoods. Bigleaf maple in particular is likely to be an important component of stands in the planning areas under many of the treatments. However, the development of bigleaf maple within Douglas-fir stands in this planning area is likely to approximate the development of western hemlock, which can function as a surrogate for bigleaf maple development in the modeling results.

Projection of the Landscape

This analysis uses the Landscape Management System (LMS) to project the initial starting conditions through the silvicultural pathways into the future. LMS is being developed as part of the Landscape Management Project at the Silviculture Laboratory, College of Forest Resources, University of Washington. The LMS model itself and additional information about LMS is available online at <http://lms.cfr.washington.edu/lms.html>. LMS is an assemblage of programs and interfaces, in which the user enters starting inventories, selects a growth model, enters the silvicultural pathways into a scenario, and establishes an analytical period. LMS supports a number of variants of the U.S. Forest Service Forest Vegetation Simulator (FVS) and the BLM Organon growth simulator. For this analysis, we selected the Western Cascade variant of FVS.

The minimum time increment used for the modeling in this analysis is 5 years, with 20 total increments (including time 0). As a result, the overall analysis period is 95 years, which is approximated to 100 years in the effects analysis. The analysis defines the year 2002 as time 0: the beginning of the analysis period. Although a longer analytical period might have revealed additional development of late-successional characteristics, especially among the youngest stands, it was too difficult to evaluate the reliability of the growth model or calibrate the results against empirical data beyond 100 years.

LMS, and the FVS model within it, are coupled to an output interface which prepares stand-level information such as relative density, basal area, quadratic mean diameter, and other commonly used stand-level statistics. In addition, the user can access individual stand inventory projections. These outputs can then be compared to empirical data to confirm the models projections and allow calibration through adjustments to the growth model. In the FVS model, this is done through use of a keyfile which modifies the growth rates, mortality rates, etc. The LMS program also interfaces to the embedded Stand Visualization System (SVS) program, which provides a visualization of the stand condition based on the stand inventory data.

For this analysis, we conducted a number of trial runs using the LMS program. Comparing modeling results with local, empirical stand data indicated that the default levels of the FVS program were allowing growth rates that were too high at high stand densities. In particular, stand relative densities were maintained at levels higher than

generally observed in real stands: many trajectories reached relative densities of 90. Therefore, the model was calibrated by reducing the maximum level the Stand Density Index by 10%. This lowered the maximum allowable stand density and increased mortality levels as stands approached high densities. The maximum allowable stand basal area was also reduced to 350 square feet/acre, which also slowed growth at very high stand densities. These changes improved the performance of the model, causing the relative densities of the stands to limit out between 55 and 65, between the zone of imminent mortality and “normality” – the maximum density usually seen in natural stands. Also, the modeled stands were very similar to empirical data on similar-aged, single-cohort natural stands in volume, basal area, trees per acre, quadratic mean diameter, and relative density. This favorable comparison suggests that the model is performing satisfactorily for the untreated stands, though perhaps still slightly overestimating growth rates in high density stands.

We made two changes to the default LMS output metrics, which improved our ability to evaluate the results against current research and the existing watershed analysis and LSR Assessment. First, the default metric for height:diameter ratio measured the average height:diameter ratio of the biggest 100 trees. Many of the proposed treatments would lower overstory density well below 100 TPA, which allowed small, underplanted trees to skew the overall stand height:diameter ratio. Therefore, we changed this measurement to the average height:diameter ratio of all Douglas-fir trees >2" dbh, eliminating the effect of underplanted seedlings. Second, the default metric for canopy cover excluded canopy contribution of overlapping tree crowns, which grossly underestimated canopy cover percentages for moderate stand densities compared to local experience and the estimate in the LSR Assessment (p. 40). We changed this measurement to count the contribution of overlapping crowns to canopy cover. This method still appears to underestimate canopy cover at moderate stand densities, but is within approximately 10% of expected values. This continuing slight underestimation of canopy cover may be resulting from the model slightly underestimating mean crown width, which we will calibrate if necessary based on the results of ongoing stand examinations. Note that this method allows the canopy cover in high density stands to exceed 100% because of the contribution of overlapping crowns.

Summarizing the Results Across the Landscape

The fundamental unit of the stand projection model in LMS is one acre. The Toggle Program, an adjunct to LMS, was used to expand these one-acre projections to the landscape level. The Toggle Program takes the outputs from LMS, adds up the available acreage for each pathway, and summarizes the conditions across the landscape.

Evaluation of Results

The results tabulated for the projections across the landscape were compared against thresholds for various issues in the analysis, such as late-successional forest structural characteristics, marbled murrelet habitat, and northern spotted owl habitat. The Toggle Program queries the output of LMS and determines which pathways and which acres meet the thresholds over time. For this analysis, those stands >80 years old at the beginning of the analysis period were removed from the modeling and presumed to have late-successional forest structure. Therefore, acres of stands currently >80 years old constitutes a base acreage to which additional acres are added as stands currently ≤80 years old acquire late-successional forest structure over time. The graphs and tables in the analysis reflect only the additional acres of stands currently ≤80 years old that acquire late-successional forest structure over time, and not the base acreage of stands currently >80 years old.

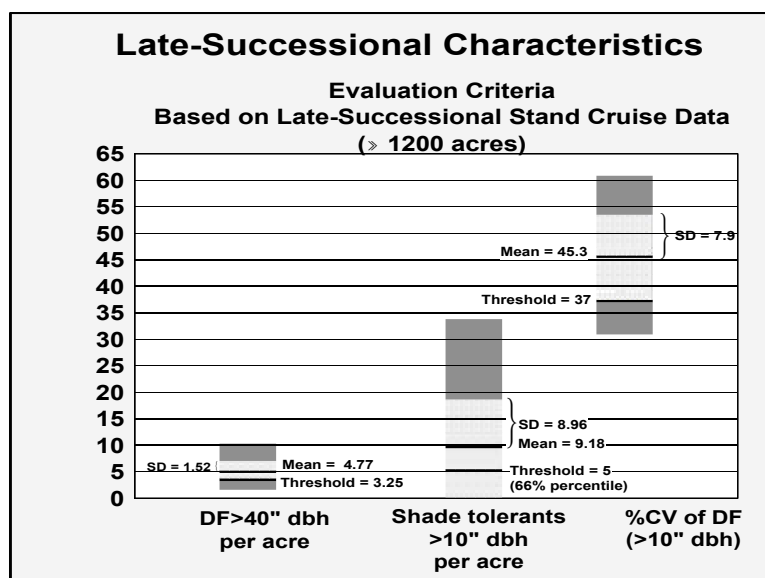
APPENDIX C

Local Late-successional Forest Characteristics

We evaluated regional averages for late-successional forest characteristics (Spies and Franklin 1988; Spies and Franklin 1991; LSR Assessment, p. 57) against local data. A recent study of BLM timber cruise data for timber sales in the late 1980s and early 1990s in the Eugene and Salem Districts evaluated late-successional forest characteristics (Poage 2001). That data set consists of 91 timber sales or sale units for which the electronic data on the sale were still available. That data set comprises a precise and accurate sample of the population of trees in sale areas of approximately 20-100 acres. We examined that data set to derive the evaluation criteria for late-successional forest structural characteristics. We extracted the portion of the data set which describes sales in the Coast Range within the Eugene District. This subset totals 1,295 acres of stand data, constituting 24 sales or sale units.

From this sub-set of the Poage data set, we calculated the mean values and standard deviations of the parameters selected: density of very large Douglas-fir (>40" dbh), density of shade-tolerant conifers (>10" dbh), and Coefficient of Variation (CV) of Douglas-fir diameters (>10" dbh). For most of these characteristics, we selected a threshold from the mean value minus one standard deviation. However, for the density of shade-tolerant conifers, the standard deviation exceeds the mean value, which appears to be a consistent pattern throughout the larger data set as well (Poage 2001, p. 35). For shade-tolerant conifers, we selected the threshold from the 66th percentile of sample values. In addition, if both the CV of diameter and the shade-tolerant levels were met, the diameter was relaxed to 32" dbh. Both of these methods of selecting the thresholds were intended to establish a threshold that represented the structural conditions of most late-successional forests, but not necessarily absolute minimum conditions found in all late-successional forests.

In addition, we have compiled a larger data set of over 4,000 acres, limited to sales within or immediately near the planning area. This data set from the timber sale summaries is not as detailed or precise: it does not provides descriptions of all trees by sizes, but just by density levels of species at the overall timber sale level, which typically contained 1-6 sale units. This data set confirms the applicability of the Poage data set by comparing the overall density parameters to similar summaries of the Poage data set. We are currently enlarging the more precise data set by adding additional sales from within or immediately near the planning area. Data similar to the Poage data set is being reconstructed from the timber cruise records.



Graph 46

Examination of this data set, which is limited to the planning area or immediate surrounding lands, will allow us to evaluate the applicability of the late-successional forest structural characteristics used in this analysis and might lead to refinement of the threshold levels. Although this more local data set is not yet fully compiled, preliminary examination suggests that it is substantially similar to the Poage data set and will not lead to any substantial modifications of the late-successional forest structural characteristic thresholds in this analysis.

APPENDIX D

Sedimentation Analysis Methodology

Introduction

Sedimentation occurring from forest practices within the planning area includes chronic delivery from road surface erosion, episodic delivery from landslides as a result of culvert failures during storm events, and temporary pulses of sediment during fish passage improvement projects, in-stream restoration projects, and new road construction. The intent of the quantification of sedimentation is to evaluate the relative contribution of sediment that could potentially occur from each activity under the different alternatives.

Road Surface Erosion

The analysis of road-related sedimentation here differs slightly from the analysis in the Siuslaw Watershed Analysis because of refinements made to the modeling assumptions, made in part in response to the findings of the 2002 road inventory.

We estimated fine sediment delivery to the stream system by field observations as part of the 2002 road inventory, in which we inventoried all BLM-controlled roads in the planning area. For purposes of calculating sedimentation, only road segments capable of delivering sediment to stream systems were identified for this analysis. Of the total 65.96 miles of road inventoried, 24.84 miles are capable of contributing sediment to streams. Using the Washington Standard Methodology for Conducting Watershed Analysis (WFPB 1995), we examined road segments for road prism characteristics and drainage deliverability. We applied factors for differing conditions of the road tread, cut and fill slopes, and traffic use. This analysis assumes average conditions: prism widths of cut slope (15'), tread (9') and fill slope (10'). Because factors used in the Washington methodology were based on a combination of studies performed in the Idaho Batholith area and elsewhere, we made one deviation to the traffic factor to more accurately reflect the lithology of the planning area.

Deviation: We calibrated the deviation in the traffic factor for this analysis from unpublished research performed in southwestern Washington (Mack Creek in the Chehalis Headwaters), which is expected to more accurately reflect sediment yields for roads built on the lithology found in southwestern Washington (Sullivan and Duncan, 1980) and the Oregon Coast Range. We multiplied the base erosion rate derived for each road segment in the watershed by a factor based on the level of traffic projected for that road segment over the next 5 years. These factors are provided in the standard methodology for no traffic, light, moderate and heavy traffic levels (WFPB 1995). Using the standard methodology, we varied the traffic factors until the results matched the field data for the same set of road segments at Mack Creek. The calibration resulted in traffic factors that are approximately 1/10th of the standard WFPB methodology traffic factors (K. Sullivan and J. Clark, 1996, personal communication).

The analysis of sedimentation in the Siuslaw Watershed Analysis did not make this deviation to the traffic factor (USDI BLM 1996a, pp. II-1 - II-8, III-8). If the total road-related sedimentation calculated in the watershed analysis were assumed to be evenly distributed across the watershed, the planning area portion of the total in the watershed analysis would be 299 cubic yards/year, as compared to the 108 cubic yards/year in our analysis here. This difference is primarily resultant from the deviation in the traffic factor, which is consistent with the field observations in the 2002 road inventory of the planning area. Also, our analysis here assumed that hauling of timber would be done primarily in the summer, in part because thinning operations in most alternatives would be seasonally limited by temporary roads (see Chapter 4 - Introduction).

Furthermore, the 2002 road inventory estimated that the relative contributions to road-related sediment delivery in the planning area are 50% from the tread, 31% from the cut-slope, and 4% from the fill-slope. The Siuslaw Watershed Analysis assumed deliveries of 40% from the tread, 40% from the cut-slope, and 20% from the fill-slope. Finally, of the 24.84 miles of road segments that the 2002 road inventory determined are capable of delivering sediment, approximately 11 miles are paved, and are therefore producing negligible sediment deliveries from the tread. The 2002 road inventory has a high confidence level, because specialists drove each road segment and identified road prism characteristics.

Basic erosion rates established by various researchers reflect the erodibility rates for roads built in different geologic materials (WFPB 1995). The planning area is dominantly composed of sedimentary geology. The rate represents erosion from the bare road prism surfaces. Road surfacing material determines the erodibility of the surface tread during traffic, particularly during heavy haul, and is adjusted according to the type and depth of surfacing material. Typically, roads in the planning area are maintained with a lift of approximately 6" of compacted, fractured gravel, mostly mixed volcanics from local quarries.

Table 10. Summary of road modeling factors

GEOLOGY	Parent Rock Code	Erosion Factor (kg/m ²)	Ground Cover		Road Surfacing			Road Use		Traffic Factor	
			%	Factor	Description	Code	Factor	Type	Code	Heavy*	Mod.*
Mica schist, volcanic ash, highly wx sedimentary, 0-2 year old road.	1	25.00	0%	1.00	Native soil	1	1.00	Mainline	1	5	0.4
Mica schist, volcanic ash, highly wx sedimentary, >2 year old road.	2	13.50	10%	0.77	Soft Rock	2	0.75	Primary	2	0.4	0.4
Quartzite, coarse-grained granite, 0-2 year old road.	3	25.00	20%	0.63	Pit Run	4	0.20	Secondary	3	0.3	0.1
Quartzite, coarse-grained granite, >2 year old road.	4	7.00	30%	0.53	Crushed Rock	5	0.50	Spur	4	0.1	0.1
Fine-grained granite, moderately wx rock, sedimentary rocks, 0-2 year old road.	5	13.50	50%	0.37	Vegetation	6	0.75				
Fine-grained granite, moderately wx rock, sedimentary rocks, >2 year old road.	6	7.00	80%	0.18	Paved	7	0.00				
Competent granite, basalt, meta-morphic rocks, relatively un-weathered rocks, 0-2 year old road.	7	4.50									

* Traffic factors recalibrated according to Mack Creek Study, Washington (Kate Sullivan, Jeffrey Clarke, Weyerhaeuser, pers. comm., 1996).

General confidence in assessing the sediment yields of road segments is moderate, although the confidence of the quality of the data collected during the road inventory is high. It is uncertain whether the planning area soils more accurately reflect the western Washington unpublished study or the Idaho Batholith studies from which the Washington Watershed Analysis methods were originally derived. The accuracy of the model reflects the quality of input information. We evaluated the rate of sediment delivery from roads using a model that simplifies a complex road system. Given the limitations in this simple model and the limitations in averaging road prism characteristics, any estimation errors would likely be uniformly applied to all inventoried roads and any errors in scale would not drastically change any of the analytical conclusions.

Landslides from Culvert Failures

During the 2002 road inventory, we identified 73 culverts that are currently at risk of failure because they are undersized, plugged, currently failing, or poorly engineered (See Table 11). That inventory found that approximately 57 miles of road have a high potential for culvert failure with delivery to streams. Of that total, approximately 26 miles are paved and 31 miles are gravel/dirt. We used only stream-crossing culverts for this quantification.

Calculating the sediment deliver to streams if these culverts were to fail required many simplifying assumptions. We included only the amount of fill calculated to exist around each culvert, and did not attempt to estimate mass wasting from debris flows or any other catastrophic road drainage problem. We assumed that an average width of road prism was 40', because this was most typical length of Siuslaw River BLM culverts (BLM oral communications, 2002); that an 18" culvert has a 4' active channel width, a 24" culvert has a 6' active channel width, a 32" culvert has a 7' active channel width, a 56" culvert has a 12' active channel width, and a 72" culvert has a 20' active channel width. We estimated that the depth of fill * the active channel width * 1.5 (to account for the slope above the culvert failure) * the average road prism width would give an approximate estimate of how much sediment would be delivered to streams if all high-risk culverts were to fail.

Although few studies have been conducted to measure suspended sediment and stream discharge during culvert removals, some monitoring reports do exist. Monitoring results from Quartz Creek, Montana revealed that different equipment operators affect the amount of sediment generated, but that overall in-stream effects are of short duration and do not affect beneficial uses (Wegner 1999). Monitoring results from the Lolo National Forest, Montana, indicate that between 1 to 2 cubic yards were introduced into the stream during and after culvert removal (Lolo, 2000). BLM personal communications, 2002, indicate that little sedimentation has been observed in the past during BLM culvert removals and replacement. The Eugene District uses best management practices such as dewatering, straw bales, and numerous bio-engineering techniques, which reduce sediment production substantially. To quantify sedimentation from culvert removal, we assumed that 1 cubic yard could potentially be delivered to the stream channel during culvert removal and replacement. We assumed that we would remove or replace culverts at an even pace over a ten-year period.

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Table 11. Culverts at Risk of Failure

Road Number	Culvert Fill Feet	CMP* Size Inches	CMP Size Feet	Total Fill Depth Feet	Active Channel Width Feet	Fill Width Feet	Stream Xing	Tread Width Feet	Cubic Feet	Cubic Yards
19-5-22.2	13	15	1.25	14.25	4	6	x	40	3420	127
19-5-22.2	13	18	1.50	1.50	4	4	x	40	40	40
19-5-22.2	15	18	1.50	16.50	4	6	x	40	3960	147
19-6-19	4	15	1.25	5.25	4	6	x	40	1260	47
19-6-19	6	20	1.67	7.67	5	7.5	x	40	2300	85
19-6-21.2	6	18	1.50	7.50	4	6	x	40	1800	67
19-6-28	2	18	1.50	3.50	4	6	x	40	840	31
19-6-28	14	18	1.50	15.50	4	6	x	40	3720	138
19-6-28	2	18	1.50	3.50	4	6	x	40	840	31
19-6-28	6	18	1.50	7.50	4	6	x	40	1800	67
19-6-28	3	18	1.50	4.50	4	6	x	40	1080	40
19-6-28	7	18	1.50	8.50	4	6	x	40	2040	76
19-6-28	5	18	1.50	6.50	4	6	x	40	1560	58
19-6-29	2	18	1.50	3.50	4	6	x	40	840	31
19-6-29	2	18	1.50	3.50	4	6	x	40	840	31
19-6-30	10	15	1.25	11.25	3	4.5	x	40	2025	75
19-6-30	10	18	1.50	11.50	4	6	x	40	2760	102
19-6-32.1	10	log	0.00	10.00		0	x	40	0	0
19-7-35	8	18	1.50	9.50	4	6	x	40	2280	84
19-7-35	5	18	1.50	6.50	4	6	x	40	1560	58
19-7-35	3	18	1.50	4.50	4	6	x	40	1080	40
19-7-35	3	18	1.50	4.50	4	6	x	40	1080	40
19-7-35	3	18	1.50	4.50	4	6	x	40	1080	40
19-7-35	5	18	1.50	6.50	4	6	x	40	1560	58
19-7-35.1	15	15	1.25	16.25	3	4.5	x	40	2925	108
19-7-35.1	20	15	1.25	21.25	3	4.5	x	40	3825	142
19-7-35.1	20	15	1.25	21.25	3	4.5	x	40	3825	142
20-5-14.1	10	18	1.50	11.50	4	6	x	40	2760	102
20-5-14.1	7	15	1.25	8.25	3	4.5	x	40	1485	55
20-5-14.1	5	15	1.25	6.25	3	4.5	x	40	1125	42
20-5-14.1	4	18	1.50	5.50	4	6	x	40	1320	49
20-5-23	12	log	0.00	12.00		0	x	40	0	0
20-5-23	15	log	0.00	15.00		0	x	40	0	0
20-5-23	20	log	0.00	20.00		0	x	40	0	0
20-5-35.7	17	log	0.00	17.00		0	x	40	0	0
20-6-4.2	8	18	1.50	9.50	4	6	x	40	2280	84
20-6-4.2	6	15	1.25	7.25	3	4.5	x	40	1305	48
20-6-4.3	18	18	1.50	19.50	4	6	x	40	4680	173
20-6-4.3	13	18	1.50	14.50	4	6	x	40	3480	129
20-6-5	6	18	1.50	7.50	4	6	x	40	1800	67
20-6-5	8	18	1.50	9.50	4	6	x	40	2280	84
20-6-9	4	18	1.50	5.50	4	6	x	40	1320	49
20-6-9	3	18	1.50	4.50	4	6	x	40	1080	40
20-6-9	4	18	1.50	5.50	4	6	x	40	1320	49

20-6-10	14	24	2.00	16.00	6	9	x	40	5760	213
20-6-10.4	12	15	1.25	13.25	3	4.5	x	40	2385	88
20-6-10.4	12	18	1.50	13.50	4	6	x	40	3240	120
20-6-11	2	18	1.50	3.50	4	6	x	40	840	31
20-6-11	4	12	1.00	5.00	3	4.5	x	40	900	33
20-6-11	5	18	1.50	6.50	4	6	x	40	1560	58
20-6-11	5	18	1.50	6.50	4	6	x	40	1560	58
20-6-11	6	18	1.50	7.50	4	6	x	40	1800	67
20-6-11	4	18	1.50	5.50	4	6	x	40	1320	49
20-6-11	7	18	1.50	8.50	4	6	x	40	2040	76
20-6-11	6	72	6.00	12.00	20	30	x	40	14400	533
20-6-11	3	18	1.50	4.50	4	6	x	40	1080	40
20-6-11	11	18	1.50	12.50	4	6	x	40	3000	111
20-6-11	4	24	2.00	6.00	6	9	x	40	2160	80
20-6-11	4	54	4.50	8.50	12	18	x	40	6120	227
20-6-11	6	24	2.00	8.00	6	9	x	40	2880	107
20-6-13	2	18	1.50	3.50	4	6	x	40	840	31
20-6-13.2	2	18	1.50	3.50	4	6	x	40	840	31
20-6-13.3	7	18	1.50	8.50	4	6	x	40	2040	76
20-6-13.3	15	18	1.50	16.50	4	6	x	40	3960	147
20-6-13.3	15	18	1.50	16.50	4	6	x	40	3960	147
20-6-13.3	12	15	1.25	1.25	3	3	x	40	40	40
20-6-21.1	10	32	2.67	12.67	7	10.5	x	40	5320	197
20-6-21.1	8	24	2.00	10.00	6	9	x	40	3600	133
20-6-21.1	9	28	2.33	11.33	6	9	x	40	4080	151
20-6-21.1	25	56	4.67	29.67	12	18	x	40	21360	791
20-6-21.1	17	18	1.50	18.50	4	6	x	40	4440	164
20-6-21.1	15	24	1.25	16.25	6	9	x	40	5850	217
TOTAL										6891
* CMP - corrugated metal pipe										

APPENDIX E

Roads Decommissioning By Alternative

The following tables list the roads and mileages that would be decommissioned under each alternative and as referenced in Appendix A. The roads listed in the tables are illustrated on the maps presented in Chapter 4. If discrepancies are found between the maps and the tables, the tables will be considered the controlling source.

Table 12. Roads being passively decommissioned

Road No.	Length		Road No.	Length
19-5-31.71	0.17		20-6-9.72	0.07
19-5-31.72	0.12		20-6-9.73	0.07
19-5-33	1.06		20-6-10.2	0.83
19-6-27.6	0.06		20-6-10.4B	0.75
19-6-27.72	0.32		20-6-17.2	0.13
19-6-27.73	0.38		20-6-17.71	0.06
19-6-31.71	0.06		20-6-19.4	0.08
19-6-31.73	0.29		20-6-23.72	0.18
19-6-33.1	0.29		20-7-1.71	0.26
19-6-35.1	0.17		20-7-3.3	0.25
19-6-35.3	0.11		20-7-3.5	0.40
19-6-35.4	0.09		20-7-3.71	0.13
19-7-35B	0.92		20-7-3.72	0.10
20-5-7A	0.50		20-7-13.71	0.25
20-5-7.1A	0.25		20-7-14.71	0.09
20-5-7.71	0.42		20-7-15	0.16
20-5-7.72	0.71		20-7-16.1B3	0.17
20-6-7.71	0.11		20-7-16.2	0.46
20-6-8.2	0.33			

Table 13. Sediment Delivery Roads (should be included for decommissioning in all action alternatives) All Alternatives

Road No.	Length
19-6-19	0.72
19-6-20.1B	0.82
19-6-21.1	0.21
19-6-27.2	0.42
19-6-27.5	1.00
19-6-28A	0.79
19-6-28B	0.28
19-6-30	1.68
19-6-32.1B	0.21
19-6-35.7	0.54
20-5-18.2D	0.54
20-5-18.4B	0.27
20-5-31C	1.26
20-520-6-1	1.25
20-5-4.3B	0.43
20-5-5.3	0.30
20-5-11E	1.45
20-5-11F	0.25
20-5-13.3B	1.29

Table 14. Roads to be Decommissioned
(does not include passively decommissioned roads)
Alternative B

Road No.	Length	Public Access (Y/N)	Comments
19-5-19.71	0.09	N	
19-5-22.2D	1.92	N	
19-5-29C	0.35	N	
19-5-30.2B	0.07	N	
19-5-30.4	0.23	N	
19-5-31.1	0.52	N	
19-5-31.3	0.21	N	
19-5-33.1	0.30	Y	
19-5-33.2	0.32	Y	
19-5-33.3A	0.13	Y	
19-5-33.3B	0.20	Y	
19-5-33.4	0.06	Y	
19-5-33.71	0.41	N	
19-5-33.72	0.17	Y	
19-6-15.6	0.30	Y	
19-6-17.71	0.61	N	
19-6-17.72	0.08	N	
19-6-17.73	0.06	N	
19-6-18B	0.18	N	
19-6-18C1	0.39	N	
19-6-18C2	0.38	N	
19-6-18.8	0.15	N	
19-6-18.9	0.16	Y	
19-6-18.1	0.30	N	
19-6-19	0.72	N	
19-6-19.1	0.21	N	
19-6-19.2	0.09	N	
19-6-19.3	0.16	N	
19-6-19.4	0.17	Y	
19-6-20.1B	0.82	N	
19-6-21.1	0.21	N	
19-6-21.2	0.68	N	
19-6-21.3	0.28	N	
19-6-21.4	0.20	N	
19-6-21.5	0.19	N	
19-6-21.6	0.12	N	
19-6-23.3	0.23	N	
19-6-23.4	0.16	N	
19-6-25	1.14	Y	

Table 14. Roads to be Decommissioned
(does not include passively decommissioned roads)
Alternative B

19-6-25.71	1.06	Y	
19-6-25.72	0.23	Y	
19-6-25.73	0.07	Y	
19-6-26B	0.15	N	
19-6-27	0.91	N	
19-6-27.1	0.65	Y	
19-6-27.2	0.42	Y	
19-6-27.3	0.15	N	
19-6-27.4	0.04	N	
19-6-27.5	1.00	Y	
19-6-27.7	0.27	N	
19-6-27.71	0.17	N	
19-6-28A	0.79	Y	
19-6-28B	0.28	Y	
19-6-28.2B	1.04	N	
19-6-28.3	0.31	N	
19-6-28.4	0.39	N	
19-6-29.5	0.25	N	
19-6-29.6	0.14	N	
19-6-30	1.68	N	
19-6-31.72	0.10	N	
19-6-32.1B	0.21	N	
19-6-33	1.30	Y	
19-6-33.2	0.18	Y	
19-6-33.3	0.27	Y	
19-6-34.1	0.14	N	
19-6-35.2	0.23	Y	
19-6-35.5	0.55	Y	
19-6-35.6A	0.21	Y	
19-6-35.7	0.54	Y	
19-6-35.8	0.70	Y	
19-6-35.9	0.04	Y	
19-6-35.1	0.11	Y	
19-7-13.1	0.20	N	
19-7-13.2	0.32	N	
19-7-14.6B	0.42	N	
19-7-14.7B	0.41	N	
19-7-23.2	0.40	N	
19-7-26B	0.19	N	
19-7-26C	0.17	N	

Table 14. Roads to be Decommissioned
(does not include passively decommissioned roads)
Alternative B

19-7-26D	0.14	N	
19-7-36B2	0.10	N	
19-7-36.3	0.53	N	
19-7-36.8B	0.43	N	
20-5-5A	0.30	N	
20-5-5.1	0.76	Y	
20-5-17.71	0.63	N	
20-5-17.72	0.57	N	
20-5-17.73	0.21	N	
20-5-18B	0.80	N	
20-5-18.2D	0.54	N	
20-5-18.4B	0.27	N	
20-5-19	0.76	N	
20-5-19.1	0.08	N	
20-5-19.2A	0.37	N	
20-5-19.3	0.43	N	
20-5-19.4	0.24	N	
20-5-20.1A	0.09	N	
20-5-20.1B	1.35	N	
20-5-20.1C	0.30	N	
20-5-20.2	0.26	N	
20-5-21.1G	0.67	N	
20-5-21.4	0.05	N	
20-5-21.5	0.05	N	
20-5-27.5D	0.64	N	
20-5-28B	1.18	N	
20-5-28D	0.05	N	
20-5-28.1	0.26	N	
20-5-29.1	0.61	N	
20-5-29.2	0.09	N	
20-5-31C	1.26	N	
20-5-31.2	0.46	Y	
20-5-31.3	0.14	Y	
20-5-31.4	0.39	Y	
20-5-33	0.68	Y	
20-5-33.1	0.16	N	
20-5-33.2	0.16	Y	
20-5-33.3	0.27	Y	
20-5-33.4	0.17	Y	
20-5-33.71	0.31	Y	

Table 14. Roads to be Decommissioned
(does not include passively decommissioned roads)
Alternative B

20-5-33.72	0.08	Y	
20-5-34.2C	0.23	N	
20-534.3	0.16	N	
20-5-34.4	0.12	N	
20-6-1	1.25	Y	
20-6-1.71	0.06	Y	
20-6-2B2	0.51	N	
20-6-3C	0.54	N	
20-6-3.1	0.49	N	
20-6-3.2	0.25	N	
20-6-3.3A	0.11	N	
20-6-3.3B	0.06	N	
20-6-4.3B	0.43	N	
20-6-4.5	0.43	N	
20-6-4.6	0.48	N	
20-6-5.3	0.30	N	
20-6-5.4	0.26	N	
20-6-5.5	0.32	N	
20-6-6.1B	0.12	N	
20-6-9.1B	1.01	N	
20-6-9.3	0.11	N	
20-6-9.4	0.13	N	
20-6-9.71	0.15	N	
20-6-11E	1.45	Y	
20-6-11F	0.25	Y	
20-6-12E	0.31	N	
20-6-12.1C	0.70	N	
20-6-13A3	0.14	N	
20-6-13B	0.60	Y	
20-6-13C	0.55	Y	
20-6-13.1A	0.62	Y	
20-6-13.1B	0.58	Y	
20-6-13.1C	0.12	Y	
20-6-13.3B	1.29	N	that part past the -23.71 road
20-6-13.5A	0.21	N	
20-6-13.5B	0.29	N	
20-6-13.6	0.34	Y	
20-6-14.1B	0.34	N	
20-6-14.2	0.85	N	
20-6-15.2	0.13	Y	

Table 14. Roads to be Decommissioned
(does not include passively decommissioned roads)
Alternative B

20-6-15.3	0.07	Y	
20-6-15.71	0.19	Y	
20-6-15.72	0.26	Y	
20-6-17.4	0.20	Y	
20-6-17.72	0.11	N	
20-6-18.2C	0.30	N	
20-6-18.3	0.71	N	
20-6-18.4C	0.35	N	
20-6-19.1	0.45	Y	
20-6-19.2	0.06	Y	
20-6-19.3	0.30	Y	
20-6-20D	0.67	N	
20-6-20.2	0.37	Y	
20-6-20.4	0.18	N	
20-6-20.5	0.31	Y	
20-6-21.2	0.46	Y	
20-6-21.3	0.10	Y	
20-6-23.1	0.56	N	
20-6-23.2	0.08	N	
20-6-29	0.45	Y	
20-6-29.1	0.09	Y	
20-6-29.2	0.06	Y	
20-7-1	0.33	N	
20-7-1.1	0.45	N	
20-7-2B	0.76	N	
20-7-4.2	0.75	N	
20-7-10	1.25	N	that part past the jct with the -3.4 road
20-7-11.2	0.14	N	
20-7-11.3	0.42	N	
20-7-11.71	0.35	N	
20-7-12	0.30	N	
20-7-14.1	0.32	N	
20-7-14.2	0.68	N	
20-7-14.3	0.08	N	
20-7-15.71	0.09	N	

Table 15. Roads to be Decommissioned
(does not include passively decommissioned roads)
Alternatives C and F

Road No.	Length	Public Access (Y/N)	Comments
19-6-19	0.72	N	
19-6-19.1	0.21	N	
19-6-19.2	0.09	N	
19-6-19.3	0.16	N	
19-6-20.1B	0.82	N	
19-6-21.1	0.21	N	
19-6-23.4	0.16	N	
19-6-25	1.14	Y	
19-6-25.71	1.06	Y	
19-6-25.72	0.23	Y	
19-6-25.73	0.07	Y	
19-6-27.2	0.42	Y	
19-6-27.5	1.00	Y	
19-6-28A	0.79	N	
19-6-28B	0.28	N	
19-6-30	1.68	N	
19-6-31.72	0.10	N	
19-6-32.1B	0.21	N	
19-6-35.5	0.55	Y	
19-6-35.6	0.21	Y	
19-6-35.7	0.54	N	
20-5-17.71	0.63	N	
20-5-17.72	0.57	N	
20-5-17.73	0.21	N	
20-5-18.2D	0.54	N	
20-5-18.4B	0.27	N	
20-5-19.2A	0.37	N	
20-5-20.1A	0.09	N	
20-5-20.1B	1.35	N	
20-5-20.1C	0.30	N	
20-5-31C	1.26	N	
20-6-1	1.25	N	
20-6-4.3B	0.43	N	
20-6-5.3	0.30	N	
20-6-6.1B	0.12	N	
20-6-11E	1.45	Y	
20-6-11F	0.25	Y	
20-6-13.3B	1.29	N	that part past the jct with helipond road
20-6-23.1	0.56	N	
20-7-2B	0.76	N	
20-7-14.2	0.68	N	
20-7-14.3	0.08	N	

Table 16. Roads to be Decommissioned
 (does not include passively decommissioned roads) Alternatives D and E

Road No.	Length	Public Access (Y/N)	Comments
19-5-19.71	0.09	N	
19-5-22.2D	1.92	N	
19-5-29C	0.35	N	
19-5-29D	0.39	N	
19-5-31.1	0.52	N	
19-5-31.3	0.21	N	
19-5-33.2	0.32	Y	
19-5-33.3A	0.13	Y	
19-5-33.3B	0.20	Y	
19-5-33.4	0.06	Y	
19-5-33.72	0.17	Y	
19-6-17.71	0.61	N	
19-6-17.72	0.08	N	
19-6-17.73	0.06	N	
19-6-19	0.72	N	
19-6-19.1	0.21	N	
19-6-19.2	0.09	N	
19-6-19.3	0.16	N	
19-6-20.1B	0.82	N	
19-6-21.1	0.21	N	
19-6-21.2	0.68	N	
19-6-21.5	0.19	N	
19-6-23.3	0.23	N	
19-6-23.4	0.16	N	
19-6-25	1.14	Y	
19-6-25.71	1.06	Y	
19-6-25.72	0.23	Y	
19-6-25.73	0.07	Y	
19-6-27.1	0.65	Y	
19-6-27.2	0.42	Y	
19-6-27.5	1.00	Y	
19-6-28A	0.79	Y	
19-6-28B	0.28	Y	
19-6-28.2B	0.50	N	
19-6-28.3	0.31	N	
19-6-30	1.68	N	
19-6-31.72	0.10	N	
19-6-32.1B	0.21	N	
19-6-33	0.25	Y	that part past jct with -33.3 road
19-6-35.2	0.23	Y	
19-6-35.5	0.55	Y	
19-6-35.6A	0.21	Y	
19-6-35.7	0.54	Y	
19-6-35.8	0.70	Y	
19-6-35.9	0.04	Y	
19-7-36.8B	0.43	N	
20-5-5.1	0.76	Y	

Table 16. Roads to be Decommissioned
(does not include passively decommissioned roads) Alternatives D and E

20-5-17.71	0.63	N	
20-5-17.72	0.57	N	
20-5-17.73	0.21	N	
20-5-18.2D	0.54	N	
20-5-18.4B	0.27	N	
20-5-19.2A	0.37	N	
20-5-19.3	0.46	N	
20-5-20.1A	0.09	N	
20-5-20.1B	1.35	N	
20-5-20.1C	0.30	N	
20-5-28B	1.18	N	
20-5-28D	0.05	N	
20-5-31C	1.26	Y	
20-5-31.2	0.46	Y	
20-5-31.3	0.14	Y	
20-5-31.4	0.39	Y	
20-5-33.1	0.16	N	
20-5-33.3	0.27	Y	
20-6-1	1.25	Y	
20-6-1.71	0.06	Y	
20-6-3.1	0.49	N	
20-6-3.2	0.25	N	
20-6-4.3B	0.43	N	
20-6-4.5	0.43	N	
20-6-5.3	0.30	N	
20-6-5.4	0.26	N	
20-6-6.1B	0.12	N	
20-6-9.1B	1.01	N	
20-6-9.71	0.15	N	
20-6-11E	1.45	N	
20-6-11F	0.25	N	
20-6-12E	0.31	N	
20-6-13.3B	1.29	N	that part past jct with helipond road
20-6-14.1	0.34	N	
20-6-14.2	0.85	N	
20-6-15.2	0.13	N	
20-6-18.2C	0.30	N	
20-6-18.3	0.71	N	
20-6-19.3	0.30	N	
20-6-20.2D	0.37	N	
20-6-23.1	0.56	N	
20-7-1	0.33	N	
20-7-2B	0.76	N	
20-7-11.3	0.42	N	
20-7-12.3B	0.33	N	
20-7-14.2	0.68	N	past the jct with the -14.3 road
20-7-15.71	0.09	N	

Inside Back Cover

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
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Draft Environmental Impact Statement
Upper Siuslaw Late-Successional Reserve Restoration Plan
Lane and Douglas Counties, Oregon